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ASTIA Document No. AD 117136

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AMERICAN METEOROLOGICAL SOCIETY
3 Joy Street
Boston, Mass.

Translation of

OBSERVATIONAL DATA OF THE SCIENTIFIC-RESEARCH DRIFTING STATION OF 1950-1951, Vols. I-III.

EDITOR, M. M. SOMOV

[Materialy nabliudenii nauchno-issledovatel'skoi dreifuiushchei stantsii 1950/51 goda, red. M. M. Somov, Leningrad, Izd. 'Morskoi Transport,' 1954–1955]

VOLUME II

SECTION 5

This translation has been made by the American Meteorological Society under contract AF 19(604)-1936, through the support and sponsorship of the

GEOPHYSICS RESEARCH DIRECTORATE
AIR FORCE CAMBRIDGE RESEARCH CENTER
AIR RESEARCH AND DEVELOPMENT COMMAND

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VISUAL OBSERVATIONS OF THE STATE OF THE DRIFTING ICE COVER

by

G. N. Iakovlev

Source:

Materialy nabliudenii nauchno-issledovatel'skoi dreifuiushchei stantsii 1950-51 goda, Ed. M. M. Somov, Vol. II, Leningrad, Izd. "Morskoi Transport", 1955. pp. 6-51.

Visual observations of the state of the ice cover were carried out during the entire time of drift, from 4 April 1950 through 9 April 1951. They supplement the various instrumental observations, including the recording of the melt and growth processes of the drifting ice, study of the morphology of the ice cover, the temperature variations of the ice, snow, and /freshwater/ pools* and the air immediately over the ice, the radiation variations, the physical-mechanical properties of the ice, etc. Furthermore, visual observations of the state of the ice cover, over the period of a whole year, have great independent value in determining the character of the drifting ice of the central part of the Arctic Basin.

The data on visual observations are given in diary form. To these data are appended charts of reconnaissances of the ice cover carried out in connection with the various removals of the base-camp sites to different sections of the floe.

1950

4 April. A crack was discovered 50 m to the east of the camp (Fig. 1, crack No. 1); its width changes continuously. At 0010 hours, it was 80-100 cm wide, at 0250 hrs, it had come together, at 1500 hrs it had separated and was 20-60 cm wide.

5 April. The width of the crack continues to change. In the morning it spread to a width of 1 m, toward the middle of the day it closed to 4-5 cm. The snow in it was squeezed upward by compression. Toward the end of the day, the crack became imperceptible. The thickness of the ice at edge of the crack varied from 90 to 150 cm.

6 April. A survey was made of the ice field on which the camp was situated and bore holes were made in the ice at different points (to measure its thickness). The floe comprises an old uneven ice field. There are many old thawed, smoothed hummocks on its surface, having the appearance of rounded mounds. The ice thickness varies between 2.30 m, at places where there are old /freshwater/ pools, to 3.50 m at elevated places. The condition of the crack does not change.

13 April. The ice field was studied for a radius of 0.75 km around the camp to select work areas. The area studied was the southeastern part of the old ice field with a very uneven profile. The ice mounds alternate with level sectors of old pools, covered over with snow, and the isthmuses

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*I have chosen the term "pool" arbitrarily, instead of "pond" or "puddle" because of the shape shown in Figures 13 and 17, but the term quite obviously also applies to the puddles of Figure 10. I have translated the Russian snezhnitsa throughout as "pool", for the sake of consistency, but will welcome any changes or suggestions the reader may have. (D.K.)

between them. The snow cover lies unevenly. There is no snow on the mounds, but in low spots it is from 20 to 60 cm thick, and in the snowbanks between the mounds it reaches 100-120 cm.

14 April. At the first thermometer area, the ice thickness was found to be 2.85 m.

15 April. The ice thickness at the thermometer area, on the mound, where the electric thermometers were set up was 3.45 m. Using a dog team, Somov and Gudkovich examined the ice field on which the camp was set up.

17 April. The ice field on which the spring airfield was located was examined to determine where test areas should be located and also to determine where to place the bench marks and stakes. The floe consisted of an even frozen lead between the old ice fields. The ice was 130-160 cm thick, the snow 3-8 cm. The area beyond the airfield was strongly hummocked. The hummocks reached heights of 3-4 m. (Fig. 2).

20 April. Study was made of the crack discovered today; it runs E-W along the snow cover between the newly situated camp and the work tent of the cryologists (Fig. 1, crack No. 3). An old sealed crack in the ice was found under the snow crack. Ice thickness in the crack - 80 cm. The ice is weak, consisting of frozen snow. After boring, the water came to the surface through the borehole and flooded the surrounding snow. The snow on the crack reached a thickness of 90-100 cm.

25 April. I. G. Petrov undertook a reconnaissance of the area of the spring airfield.

26 April. An area was selected near the airfield for outfitting five experimental platforms 30 x 50 m. The platforms were marked out, and five stakes were set up on them to determine ablation. The ice was 145-150 cm thick at the platforms, the snow 3-8 cm.

28 April. Reconnaissance was made of the ice field. A photograph was taken of the camp.

29 April. The first block of ice was chopped cut at the test areas of the airfield to determine the physical-mechanical properties of the ice. The work was not finished because a crack ran through the floe (Fig. 1, crack No. 2) and the crack began to spread rapidly. (Fig. 3). A segment 250 m long was cut off from the airfield. The test areas were located on this cut-off segment and it was hard to get to them, since the crack had spread to a width of 20 m even in the narrow places. Work had to be organized to rescue the equipment across the crack. A raft was made from empty iron drums; all the equipment was transferred to the other side of the crack on this raft in several trips, a taut rope being used to aid in the operation.

2 May. In studying crack No. 2 we discovered that it, too, passes the field on which the camp is located, 400 m to the scuth of it. The crack has closed and the young ice is hurmocking.

3 May. Reconnaissance was made in the region of the airfield. Crack No. 2 closed and the young ice hummocked. A number of new cracks appeared on the cut-off part of the airfield; the whole area with the experimental platforms was broken into fragments and carried to the east of the basic part of the airfield.

5 May. Crack No. 2 froze over. A crossing could be made to the experimental platforms.

7 May. The ice reached a thickness of 1.1 m at crack No. 3 due to the freezing of the water-moistened snow. The water came to the surface through the boreholes.

13 May. Up till this time there had been no changes at the airfield, with the exception of slight movements of the ice at the cracks. On 13 May a new crack ran across the airfield, north of the first cracks; the new crack (No. 4) was as much as 0.5 m wide. Hummocking of both young and old ice was observed at the old cracks (Fig. 4). The snow cover along crack No. 3 again burst; its orientation was distinct.

14 May. Crack No. 1 spread to 0.5 m. New cracks appeared at the airfield, north of crack No. 4; the old ones opened. Thus the airfield was broken into separate parts.

15 May. Crack No. 5, up to 0.5 m wide with open water, was discovered to the west along the surveying profile, 250 m from bench mark No. 3 in a N-S direction. It continued scuthward till it joined crack No. 2. In the camp area an old sealed crack was discovered (No. 6), running as far as crack No. 3. Water was found under compact snow on crack No. 3, 200 m to the west of the place where 3 and 6 joined.

16 May. The two edges of crack No. 2 were displaced 250 m. As a result, open leads up to 15-20 m wide formed in places; elsewhere hummocking took place. The hummocks consisted not only of young ice, which had grown to a thickness of 30-40 cm in the crack during that time, but also of year-old ice 1.5 m thick. Hummocking, with subsequent spreading of crack No. 4 to a width of 25-30 m, was also noted in the area of the broken airfield.

19 May. An old sealed crack was found southeast of the camp.

21 May. Crack No. 1 parted 0.5 m.

22 May. The sector with crack No. 5 was studied (north of the surveying profile). The crack, 10-50 cm wide, was covered with a layer of snow 40-50 cm thick. Under the snow was water. It was found that this crack, 1.2 km from crack No. 2, joined a new crack (No. 7). This latter ran

WNW-ESE and joined crack No. 1 almost at a right angle (see Fig. 6). In investigating the floe of 3 May, the beginning of crack No. 7 was assumed to be an extension of crack No. 1, while now it has been established that No. 1 runs farther to the NE.

Thus it was conclusively shown that the drifting camp was situated on a sector of the old ice field, bounded by cracks No. 5 and 7. This sector was almost square, measuring 1.1 x 1.1 km. On the sector itself, under the snow, a series of old sealed cracks were detected (e.g., cracks No. 3 and 6). A number of such cracks, obviously were of thermal origin, since they did not pass through the entire ice cover.

24 May. The area of the broken airfield was studied. At 1300 hours cracks No. 1 and 4 were 30-40 cm wide, crack No. 7, 2-3 m wide. In 15 minutes No. 7 spread rapidly to 20-25 m, and in places to 35 m, after which further spreading stopped. During this time the width of the other cracks also increased (e.g., crack No. 4 to 1.5-2.0 m). Crack No. 1 on the segment between cracks No. 2 and 4 spread to 20-25 m, and then gradually narrowed, comprising just 30-40 cm in all at crack No. 7. At this latter point, at 0230 hours crack No. 1 sealed and hummocking began. Within half an hour hummocks up to 1.5 m high formed. At that time crack No. 5 appeared compressed, but without noticeable traces of hummocking.

At 0500 hours G. N. Iakovlev and I. G. Petrov examined crack No. 1 in a rubber life raft (Fig. 5) and entered crack No. 2. Crack No. 2 was 40-50 m wide at its juncture with No. 1 and beyond. A reconnaissance map was constructed on the basis of this examination (Fig. 6).

27 May. In connection with the arrival of V. M. Perov's plane, a road was laid out on the remaining unbroken part of the landing strip. The road passed across crack No. 1, north of its junction with crack No. 4. There the crack came together; in places hummocking of the ice took place. The navigator, G. V. Fedotov, surveyed the state of the surrounding ice. According to him, there were large open leads 8 km to the north and 17 km to the south, oriented E-W. The ice cover between the leads was marked with numerous cracks. Hummock ridges were encountered; they ran in all directions. The least concentration of ice (8-9 tenths) was noted in an easterly direction; southward it increased to 9-tenths. Only in the west and before the leads to the north did the ice concentration reach 10-tenths.

28 May. In the junction area of cracks No. 1 and 4 the ice thickness had reached 1.0-1.5 m. The passage to the airfield was disrupted. Hummocking took place farther north, in the direction of crack No. 7. The adjacent year-old ice was broken up and small floes hummocked to a height of 1.5 m. It could be seen how the field with the airstrip was turning counterclockwise and how the segment where compression and hummocking had taken place earlier at crack No. 1 was slowly shifting to the north. To the south, on the other hand, crack No. 1 was spreading.

29 May. Changes in the ice conditions could have been expected in connection with the strong east wind, but no real changes took place. Crack No. 4 near crack No. 1 contracted. Compression and hummocking continued at crack No. 1 on the segment between cracks No. 4 and 7. The number of hummocks formed from 1½ m year-old ice increased. The field on which the airstrip was located has been turning counterclockwise as before and, in the northern part, it has been pressing on the floe with the camp.

The ice thickness at the airfield has increased 1-2 cm during the past 10 days.

30 May. Crack No. 1 spread 1.5-2.0 m at the junction with crack No. 4. The passage to the airfield was disrupted.

31 May. Crack No. 1 was tightly compressed between cracks 4 and 7; it decreased in width to 2 m between cracks No. 2 and 4. There is a layer of sludge up to 4 cm thick on the surface of the water.

2 June. Crack No. 1 spread to 50 m; in places it was crammed with finely ground ice. Crack No. 5 was tightly compressed along its whole extent and covered with snow, so that it was hard to detect.

3 June. Crack No. 7 spread, in places it reached a width of 200-250 m. The water surface was open. Crack No. 1 was sealed.

4 June. Crack No. 7 remains as wide as it was. Crack No. 1 has spread to 2-3 m.

6 June. The cracks were examined. Crack No. 1 had sealed tightly in places. New cracks have formed in semicircles around crack No. 1, because of the settling of the edge under the pressure of the hummocked ice.

7 June. Crack No. 1 sealed tightly at the junction with crack No. 4; it was possible to pass over to the airfield. A number of fine cracks, intersecting the airfield in various directions, was clearly visible, since the snow had been blown from the surface of the ice. Crack No. 5 parted 1.5 to 2.0 m along its entire length.

9 June. North of crack No. 2, crack No. 1 parted 75-100 m. Crack No. 2, on the other hand, sealed tightly. Continuous hummocky ridges formed at the edges. Crack No. 1 was 25-30 m wide south of the junction with crack No. 2. Earlier it was sealed and not discernible. Crack No. 5 has parted 10-15 m, only here and there do the edges touch; open water is visible. Crack No. 7 has spread still more; a layer of sludge and snow 8-10 cm thick is floating at the edges of the crack, in the center there is broken ice.

12 June. Recently the ice has begun to melt in connection with the arrival of positive air temperature; it first began to melt on the mounds and isthmuses between the pools, where it turned blue and stood out against the general white background. The width of crack No. 1 has increased to 30-40 m; sludge and small floes float on the surface.

13 June. The snow is melting. The upper layer of broken, loose ice on the mounds is melting. Where the snow cover is thin, it is permeated with water all the way through. Meltwater has accumulated in the funnel-shaped holes around the electric thermometers at the first thermometer area. On the sectors with a thick snow cover, the lower layer of snow has not yet become permeated with meltwater. Due to thawing, a pattern of thaw lines has appeared on the surface of the ice, reminiscent of crocodile skin.

14 June. The second day of rain. Air temperature positive. The snow is melting fast. The water accumulated under the snow is running off into the lower places. The mounds are drying out. Even in the drifts, the snow is permeated with the water, which is accumulating under it. At the second thermometer area, under snow 60-70 cm thick, there is a layer of water up to 5 cm deep. There is much water up to 3 cm around the boreholes that are cleared of snow along the surveying profile. The boreholes themselves have frozen over, and the water remains on top of them. The snow surface has become uneven due to melting. (Fig. 7).

16 June. The first pond (1.0 x 1.5 m, depth 10 cm) has formed next to the psychrometric work area. There is meltwater everywhere under the snow. When walked on the snow gives way underfoot. The mounds have become completely bare and stand out as blue spots on the white snow surface. The test area on the old ice was surveyed and sketched to determine the extent of the pools.

17 June. Water ran out from under the snow on high places and accumulated in the lower places where it reached a depth of 30 cm. Separate pools formed on the ice.

18 June. A frozen crust appeared on the surface of the snow. There was thin ice on the pools (3-4 mm thick); in places large and small air bubbles could be seen under the ice. The depth of the water at test area was measured. The spring airfield was examined. No essential changes had occurred in that area. Since the cracks had sealed, we could walk about the whole airfield.

A number of local cracks formed at the airfield during ice compression. Occasional traces of pools in the process of formation could be seen on the smooth snow (water depth 2-4 cm). Pools appeared on both sides of the airfield, in places where the snow had been heaped during the clearing operation. Probably the ice had sagged under the load, and meltwater from the airfield had accumulated here. Water depth, 8-10 cm.

The ice under the fuel drums which had been placed along the axis of the airfield, melted to a depth of 8-16 cm for a radius of one and one half times larger than that of the drum. Dirty water accumulated in the depressions and further assisted the melting. All objects left earlier upon the ice of the airfield sank into the ice and were covered with water. A hole 30 cm deep, filled with water, formed under a dark greasy spot 1.5 m in diameter.

In the sector where the stakes had been set, there were no pools, the surface of the airfield was quite even, covered with a thin crust of ice. The floe at that sector was broken into many pieces, and the melting was progressing uniformly on each fragment, since the meltwater flowed continually into the cracks, not remaining on the surface. This was the reason for such an even ice surface. Pools 10-12 cm deep formed in places near the airfield. Water accumulated in low spots under the snow. Crack No. 1 is 20-30 m wide, crack No. 7 has narrowed to 50 m.

19 June. The pools on the ice have been covered with a crust of fresh ice 8-10 mm thick, made up of friable crystals of columnar structure. At night the crust thickens and it remains during the day.

Freezing temperature, snow is falling. The snow cover does not break so readily underfoot. When boreholes are made in the old ice, water drains off, the ice dries out, but the holes quickly freeze over. For the present no real flow of water under the ice through the cracks has been detected.

The number of pools at the spring airfield (year-old ice) has increased. Water is running into the cracks and the pools are drying up. Over the whole airfield the upper layer of ice, 10-15 cm thick has softened and a pole can easily be shoved through it. Boreholes were made under the drums and the water drained off. The holes have been filled with snow to slow down melting.

The number of pools on the old field has increased. All the low spots are covered with water up to 30 cm deep, which has run down from the mounds. In places the water has come to the surface of the snow, in places it is beneath the snow. There is no water under the snow in the high places. Crack No. 1 converged such that we could cross it to the airfield. (Fig. 8). Crack No. 7 is 15-20 m wide.

20 June. State of the ice cover without essential changes. Melting has slowed down somewhat because of slight cooling. The pools are covered with a crust of ice; water bubbles are visible below it. The sector of the ice field next to the spring airfield (at bench mark No. 2) shows a number of sealed cracks. Almost all the snow has melted from the ice surface, and it is covered with a murky white crust of frozen snow. The "hotbed" effect is evident.

Crack No. 1 is compressed as before; there are many fresh hummocks along it. Along the edges of the crack on the field where the airfield is located hummocks rise to a height of 1.5 m; the newly hummocked ice is 30-40 cm thick.

21 June. After yesterday's rain the water level on the ice raised perceptibly, the snow settled. The number and size of the pools increased. A pool formed right up to the electric thermometers at area No. 1. New pools appeared at the test area. The snow is melting rapidly on the year-old field, and pools are forming in the low spots. The pools in the middle

of the airfield are few and small in size (up to 2 m in diameter), along the edges there are more pools, especially where snow has accumulated. Snow remains in the holes which had formed earlier under the fuel drums, and the ice under the snow is not melting. A second sketch of the pools was made. We have begun to clear the snow from test areas No. 1 and 2.

22 June. The snow has melted from the elevated places on the old ice field; the ice has begun to melt. A layer of coarse (up to 2 cm) melted ice crystals has formed on its surface 2-5 cm thick. A brush, as it were, of melted protruding ice crystals forms at the surface during thawing. Wind and thaw break off these little columns of ice and form a layer of melted ice granules on the surface. Often such a layer is erroneously taken for snow.

The water in the pools reaches depths of 30-40 cm. Snow 50-60 cm deep still remains at sites of former snowdrifts, especially in low places; water accumulates below the snow. The lower layer of snow is wet to the extent of 4-5 cm. The first stream has appeared between the pools. Due to thawing of the snow on the bare ice, many surface cracks of thermal origin have appeared, passing in various directions and covering the ice in a network. The ice dries out near the open leads, since the water drains freely from the surface. Due to lack of drainage in the middle of the floe, water accumulates on the surface, and its level rises.

Near snow crack No. 3, water accumulated in a layer up to 40 cm deep and flowed off in both directions, flooding the surrounding snow.

Intensive thawing is taking place around the airfield: the snow has disappeared almost everywhere, the ice is melting, there is water beneath the snowdrifts. There are many pools on the surface of the ice (Fig. 9).

The number of pools also is increasing at the airfield itself; especially at the edges. As the water level rises, it begins to flood the airstrip, and the new pools cause an intensive and uneven melting of the ice. In carrying out future work on the ice, this should be taken into consideration. When the airfield is cleared in the winter, the snow should be carted off as far as possible. When melting begins, ditches must be cut into the ice around the test area. These ditches will hinder the flow of water onto that area and at the same time drain it.

Many pools, up to 10 cm deep, have appeared on the sector containing the test areas. There are fewer pools on the areas which had been cleared of snow. Water has accumulated in large amount along the test areas, near the ridge of snow-covered hummocks, where the ice had sagged somewhat under the weight.

The two test areas have been cleared of snow.

23 June. An "all hands" call was made to dry the test area. 80 boreholes were made in the pools, the water drained off, 80 holes were bored along its edges. Thanks to these measures, the surface of the ice dried considerably. To delay melting, the old frozen crack which intersected the area, was filled in with snow. Before this fill in, the level of the ice in the crack was 15 cm below the level of the surrounding field.

18 holes were also bored through at the test areas, and 4 ditches were chopped out to carry off the water. The ice dried out noticeably and turned white. Everywhere on the level sections the ice was disrupted at the surface. The thin crust on the surface of the ice broke easily when walked on.

A layer of shavings 1 cm thick was poured over a test area 4 x 4 m (No. 5/1 cm).

24 June. The work on drying the work areas was continued (28 holes were bored and several ditches were cut), the results were positive. Three platforms were dried out on the test areas. Their surface was completely level. The holes bored earlier between the test areas and the hummock ridge were eroded and they turned into small ice holes. The sector with the shavings melted from below in places and the shavings slid off into small depressions revealing protruding small ice mounds. An area 4 x 4 m was spread with a layer of shavings 4 cm thick (No. 5/4 cm).

Separate pools merged on the old ice field (Fig. 10); the total area covered by water increased. In the area of the camp a number of holes were bored which allowed the water to begin flowing off under the ice and lessened the threat of a flood. The living quarter tents of the aerologists and the magneticians were transferred from the flood zone onto higher ground. In place of old crack No. 3, a whole lake formed with water up to 60 cm deep. It was very difficult to get to the work areas. A hole 19 cm in diameter was bored in the crack through which the water began to flow out quickly under the ice (Fig. 11).

25 June. Work continued on drying out the test areas. Yesterday's hole at crack 3 has eroded. Water is pouring out under the ice. The adjoining area is drying out somewhat, a flow of water has begun toward that ice hole from neighboring regions. Water is pouring into crack No. 3 in streamlets. Almost 30 pct of the entire area of the floe is already covered with water.

A third sketch of the fresh pools on the experimental area was made. The surface occuped by water had increased as compared with the two previous surveys.

26 June. It is snowing. There is a water-and-snow gruel in the pools. The ice is covered with snow. The sector at crack No. 3 is almost completely dried out and covered with snow.

27 June. A snowstorm has been in progress for nearly 24 hours. Practically all the pools are covered with snow, among them those on the experimental area. Crack No. 1 parted 100 m.

28 June. During the snowfall, the airfield was covered with an even layer of snow 7-8 cm thick. All pools on the year-old ice were covered with snow and stood out as white circular spots on the gray background of the ice.

The test areas were also covered with snow 7-8 cm thick. All work on clearing the three areas of snow has come to naught. The old holes have frozen over. There is no snow on area No. 5/4 cm; it is somewhat higher than the surrounding surface. The area has become uneven. The snow has melted unevenly under the shavings. Obviously, the material had been spread unevenly and was not uniform itself. The layer of shavings was leveled off.

Half of area No. 5/1 cm was snow-covered, in the remaining part the shavings lay under water in an even layer (water depth, 2-5 cm); the pieces of bark, chips and coarse particles float on the surface. Holes were bored and the water drained off.

An area 3 x 5 m was covered with a layer of shavings 2 cm thick (No. 5/2 cm).

29 June. Snow continues to fall. Frosts have begun at night, a snow crust has formed. Ice has appeared on the pools. The snow is frozen through.

30 June. A new crack was found (No. 8) on the floe where the airfield is located, separating the test areas from it. Crack No. 5 spread 25-30 m. Large leads were visible to the east of the airfield.

After drying out the area near snow crack No. 3 and after the snow had melted, it was revealed that the old sealed crack in the ice was 4-5 m wide, ice thickness 1.0-1.2 m.

1 July. The snow is melting. Under it is water. Water has accumulated on the test areas which had been cleared of snow. Area No. 5/1 cm is completely covered with snow. Snow has melted from areas No. 5/2 cm and 5/4 cm and the shavings can be seen. Under it the ice is thawing unevenly, mounds and depressions are forming. By way of experiment, the layer of shavings was leveled out on half of each area.

The surface of the airfield was completely level. Snow thickness has reached 12 cm. No pools can be seen. There is little water beneath the snow.

3 July. On a selected sector of the old field, where the summer airfield will be constructed, holes were bored and the water drained from the pools. Thawing was slowed down because of slightly cooler weather.

4 July. The water was drained from the test areas (13 holes were bored into the ice, and the drainage ditches were deepened). There are no pools on the areas with natural surface, the snow lies in an even layer 5-8 cm thick; under it, here and there, is water. Pools have appeared on the areas cleared of snow. On the surrounding ice the area occupied by pools has increased; they are up to 50 cm deep.

There is no noticeable melting of ice on areas No. 5/2 cm and 5/4 cm; they rise above the natural ice. Under the shavings there is hard and dry ice, in contrast to the disrupted layer of ice on the natural sectors. The snow did not melt completely on area No. 5/1 cm; there is much water above, over the shavings. The surface of the area is somewhat below the surface of the natural ice.

5 July. An area 10 x 3 m was cleared of snow and spread with a layer of shavings 3 cm thick (No. 5/3 cm). Due to the cooler weather the wet snow had frozen to the ice making it difficult to clear away.

The cleared areas dried as the water drained off. Melting of newly fallen snow was not detectable.

6 July. Thawing was renewed in connection with warmer weather. Area No. 5/1 cm was flooded with meltwater and partially covered with snow. The water does not run off the area because there is no difference in the levels of the water and the ocean. On the contrary, water is flowing into the area from the higher sectors. The shavings lie on the ice in an even layer under 3-4 cm of water.

The snow has completely melted on area No. 5/2 cm, which rises above the surface of the floe, and has run off in the ditches. The surface of the area is uneven, the height of the little mounds is 3-4 cm. The ice under the shavings is strong, yellowish-blue, it melts unevenly, and during melting of the ice the shavings shift around. The ice is melting along the sides of the area, and the shavings are running off in the ditches. It is becoming gradually smaller on the part of the area where the layer of shavings is systematically leveled off, the surface there is smoother.

The surface of area No. 5/4 cm is evener; it rises above the others.

The surface of area No. 5/3 cm is even.

On the area cleared of snow, from which water was systematically drained, one occasionally finds small pools 2-3 cm deep; fundamentally the surface is even, covered with a white snow crust. The ice in the surface layer is not strong, it gives easily underfoot.

The area with snow and water drainage is level, there are no pools. The area with snow and without drainage is also even, but has pools 5-6 cm deep. The area without snow and without drainage is level, in places pools 3-4 cm deep can be seen.

Fair sized lakes of water up to 30 cm deep have formed on the surrounding ice.

7 July. Melting of snow has stopped. Gray spots appear at night on the level white surface of the airfield; water is accumulating. It has to be drained off to prevent the formation of pools. The water level on the old field has dropped, obviously the water has begun to drain off under the ice. Mounds and elevated places are sharply demarcated. The experimental area on the old ice has become free of snow. The greatest water depth in the pools on that area is 23 cm.

For the second day work has been undertaken to level out the surface of the old ice field for an airfield: snow is taken from the mounds, water is drained off under the ice, depressions are filled in with snow.

At the same time, old crack No. 3 is being filled in, where the level of the ice is lower than the level at the edges of the crack.

8 July. Work at the test area continues; 67 boreholes have been made and the surface of the area again dried out. Several pools have been filled in with snow.

A constant air temperature has been maintained all day (1.5°); intensive thawing. The scund of the settling of the snowcrust can be heard continuously.

9 July. Area No. 5/1 cm is level, covered with 12 cm of water. The ice under the shavings is melting faster, and its level is lower than that in the surrounding area. Water does not drain off the area into the boreholes.

Area No. 5/2 cm is uneven, height of the mounds from 3-10 cm. The ice under the shavings is strong. Where the shavings are systematically evened out, the surface is evener, there are fewer mounds.

The size of the area with shavings is becoming noticeably smaller due to the melting of ice from the sides; the shavings are spreading, and ditches filled with water and shavings are forming around the test areas. Water does not run off under the ice.

The surface of area No. 5/4 cm is evener than at the other areas; it rises above the others. The ice under the shavings is strong.

Area No. 5/3 cm is melting similarly to area No. 5/4 cm.

Thawing is proceeding intensively at test areas Nos. 1-4. The most even surface is on the area with natural snow and with drainage. A white snowcrust has formed on the areas cleared of snow; when walked on this crust breaks and collapses. There is a fragile layer of ice under the crust, it has been disrupted by melting. A snow cover better protects the ice from thawing than does the snowcrust, since the "hothouse" effect occurs under it.

Work continues on leveling out the surface of the old ice field. Several mounds have been covered with sacks to speed thawing.

10 July. The size of all the areas with shavings is quickly diminishing, the mounds are becoming larger (Fig. 12). Twenty boreholes were made in the drained areas, the ice was dried. Due to the small difference in levels, the water drains slowly from the ponds.

Generally, all year-old ice sits very low in the water: 50-60 pct of the entire area is covered with pools up to 30 cm deep. On the other hand, the old field is drying out more and more and, apparently, is rising, judging by the ice edge of the cracks. The mounds and the isthmuses between the pools stood out sharply. Snow remains only in places where there were snowdrifts.

12 July. The test area without water drainage, cleared of snow, is 50 pct covered with pools. The water in the pools reaches 15-16 cm. The ice is fragile at the bottom of the pools, it is easy to shove a metal rod into it to a depth of 35 cm (counting from the water level). The ice is also fragile on the dry sectors; a rod can be pushed down 25 cm. When walked on, the upper crust of the disrupted ice breaks, footprints remain on the surface.

Some water, probably, is draining into the pools from the surrounding region.

The area with snow and without water drainage is 30-40 pct covered with pools. Depth of the pools 5-8 cm, in places 20 cm. The snow has completely melted from that area, and it differs noticeably from the neighboring area.

13 July. The ice continues to melt. On the experimental areas the water has ceased draining off from the pools. The water levels in them have become the same as the level of the sea. The ice columns are melting ever lower and are breaking; a whitish layer of broken ice, crystals 4-5 cm thick, is forming on the surface. Below it is fragile ice formed from melted ice columns, between which it is easy to shove a rod.

The bottom of the pools is like a brush of upward-projecting ice columns with sharpened ends. It differs from the thawing of ice in open places in that the columns in the ponds do not break but thaw from the sides and from above, gradually becoming shorter. They have an irregular cross section, the area of which gradually decreases upward. Due to this condition of the surface of the bottom of the pools, the ice there is not slippery when when one walks around in the pools. Sometimes on the bottom of the pools, at the tops of the ice columns, in the water, during windless weather, one can observe whitish formations like clouds of ice destroyed by melting and weakly bound to the columns. These formations are the product of the gradual destruction of the columns, and at the slightest disturbance of the water in the pools, due to mechanical or thermal causes, the ice clouds are torn loose, float and quickly melt, disappearing. Sometimes small ice crystals can be seen on the surface of the water, they are remnants of a floating ice cloud.

The banks of the pools have melted around, they are sharply outlined now and have become steep as compared with the initial period of thaw when they had a gradual slope (Fig. 13).

15 July. The entire surface of the old field is covered with a white layer of disrupted granular ice.

Work continues on draining off the water which is flooding the tents. Despite the boring of holes, the water has ceased draining off under the ice from the deep pools.

All the cracks around the field on which the camp is situated have sealed, the ice has come together. In places there is hummocking of the year-old ice. The sector of the airfield, where the stakes had been frozen in, has broken up into tiny floes, whose surface is completely level. Meltwater is running off into the cracks.

17 July. During the night there was a slight frost. The pools were covered with a thin layer of ice (3 mm).

The surface layer of ice, which had been disrupted by melting, is so fragile that it can easily be broken with a spade. The day after the surface layer of ice had been cleared, the surface again became white and a new layer of disrupted ice appeared.

Work was carried out at the spring airfield, water was drained and the cracks were filled in with snow.

18 July. The surface of the airfield is level. There are several pools along the edges of the area. Water does not run off under the ice at the old crack which had been filled with snow. Ice holes up to 50 cm in diameter have formed at the boreholes.

The disrupted layer of surface ice is 6-10 cm thick. A rod can be shoved down 18 cm into the ice. The ice floe is 130 cm thick. There are many deep pools (up to 50 cm deep) on the field surrounding the airfield.

The sectors with shavings are thawing from the sides, and their areas rapidly diminishing. Area No. 5/1 cm is covered with a layer of water 35 cm deep. There is an even surface under the water. Ice holes have formed from the boreholes.

Area No. 5/2 cm has melted 1 m at the sides. The shavings lie in the water in the melted sector; on the remaining part the ice is strong under the shavings, no sign of destruction; the surface is moundy.

Area No. 5/3 cm has melted 70 cm on the sides. The surface is evener (Fig. 14) than at area No. 5/2 cm. At area No. 5/4 cm the surface is still evener, there are fewer mounds. The test area has melted from the sides, hanging ice cornices, covered with shavings, have formed.

At the test areas with water drainage, pools develop more slowly than on the areas without drainage. Water does not drain from the pools under the ice. The surface layer of disrupted ice (6-8 cm) is identical at all areas.

Thin sheets of ice-like scales (diameter up to 5 cm) have appeared at the surface of the old floe. The framework of these sheets consists of ice crystals in the form of long needles, the space between which is covered with a thin membrane of ice of vesicular /bubbly/ structure.

19 July. The test areas at the airfield were surveyed.

Ice melting continues, but slight frosts have begun at night. Shallow pools freeze at night and a thin crust of ice remains on the surface.

One can observe the interesting phenomenon of abundant sublimation of water vapor. There is a mass formation of ice lozenges (ice flowers), up to 5-10 cm in diameter and 1-2 mm thick, at the surface of the ice in the pools. The shell consists of needle-like crystals joined by ice of vesicular /bubbly/ structure (Fig. 15). During the day the lozenges melt and are partially destroyed; rime and hoarfrost gradually settle on the remaining ones. The lozenges turn white, become fluffy, and part of them break under the weight of the rime.

Besides drainage of water under the ice, the ice field is drying from the freezing of the pools. A layer of melted ice columns, sharpened from above, remains on the bottom of such pools.

The pools are getting deeper. The leads around the old field "breathe" continuously, now converging, now separating.

22 July. The ice continues to melt. At night the pools are covered over with a crust of ice.

At the airfield work continues on filling the cracks and pools with snow. The stakes have melted out of the year-old ice. At an ice hole, on the area with shavings, a thin layer of fresh fragile ice 2-3 cm was discovered at the level of the lower surface.

23 July. The thermal cracks at the surface of the ice in the region of thermometer area No. 2 parted 3-4 cm; depth 45 cm. A similar phenomenon was discovered in other places as well.

24 July. The living-quarter tent of the cryologists was transferred to a new place, since the surrounding ice had melted, and the tent had settled. Directly under the tent there was practically no thawing, thanks to the good heat insulation of the ice from the reindeer skins and canvases. As a result, a round ice column up to 70 cm high formed under the tent (Fig. 16). It became difficult to enter the tent and stand up to full height.

During the thaw season such phenomena occurred often, and the tents had to be moved more than once. If the tents were not situated on a high place, a lake of meltwater up to 0.5 m deep would form around it, apart from the column. Boreholes were used to combat this phenomenon, but the borehole method was effective only for rather shallow lakes. In the deeper lakes this method could reduce the level of the lake only to sea level, and in the end the tents had to be moved to higher ground anyway.

25 July. Warm day. The ice melting, which had slowed down recently due to the cool weather, began again. The ice mound with smooth sides, on which the periodic surveying was conducted, turned into several small mounds due to thawing. The same phenomenon was observed in other mounds.

The melting around the edges of the pools was very distinct, the banks became precipitous and cornices hung over the water surface (Fig. 17).

The surface of several pools was covered with thin ice (1.0-1.5 cm).

26 July. The microrelief of the thawing surface of the ice is changing gradually. Because of uneven thawing, the surface in various sectors is becoming less even, porous. Broken ice columns are gradually melting and decreasing in size. The cornices on the banks of the pools are melting from below and falling into the water. The sound of ice cornices breaking off can be heard constantly.

The surface of the melting ice is becoming more and more like that of melting snow, which in turn is reminiscent of crocodile skin. Small, comparatively level ice areas are separated by hollows and depressions that form as a result of uneven thawing and settling of the ice in these places. When the disrupted layer of ice is cleared away, one can see little brushes, as it were, of upward-projecting, sharpened ice crystals. A rod can be shoved into such a disrupted ice layer easily: 5-10 cm into an old field, 20-25 cm into a year-old field.

27 July. The microrelief of the surface of the year-old floe and of the airfield is analogous to the microrelief of the old field. Ice caps 4-5 cm high have formed on the year-old field from sheets of ice situated at different angles to the surface. They look like fish scales.

The depth of the pools and cracks, which had been filled in with snow, had remained practically the same. Thawing is proceeding slowly. All the snow is permeated with water.

The southern banks of the pools on the old ice, at a distance of 30-50 cm from the edge, are fringed with small depressions. Water has appeared in the deepest of them. We haven't been able to explain this phenomenon as yet.

31 July. Ice melting has slowed down. During the nightly frosts, the pools are regularly covered by a crust of ice. The ice granules and columns are noticeably smaller, they have become more azure, revealing their skeletal form.

The thickness of the disrupted layer of ice has increased to 10-15 cm; the ice has become white. When walked on, as in the case of snow, it collapses, the ice granules become powdery.

For the second day a sparse snow is falling in the form of fine little needles, which have powdered the surface of the ice in a thin layer (2-3 mm). The snow is distributed unevenly, covering chiefly the ice caps and the high places.

1 August. The break between summer and fall has become obvious. The pools have a continuous ice cover, on which lies a thin layer of snow. The ice is murky, with a large number of air bubbles.

The disrupted surface layer of ice has frozen from below and has become stronger, it powders when walked on.

2 August. Sunny day. The leads between the floes are continually expanding and contracting. An easterly wind is blowing, the airfield floe is pressing on the floe where the camp is located. The ice is hummocking noisily at the edge. Because of the hummocking, it has become possible to photograph the underside of the upturned block of ice. It is uneven with pockmarks up to 20-30 cm deep (Fig. 18).

The surface of the year-old ice has taken on an autumn character. The ice is lightly sprinkled with snow. The hummocks have melted around the edges, their contours are smoothed. The banks of the pools have melted around and cornices hang over the pools, which are as much as 40 cm deep. There are few pools on the drained test areas, and they are small. There are more pools on the undrained sections.

The areas with shavings have greatly diminished because of melting along the edges. The size of area No. 5/3 cm is now 0.6 x 7.0 m while initially it was 3 x 10 m. The surface is uneven, consisting of small mounds. The ice has melted underneath, along the edges, and ice cornices with icicles hang over the water. The area of No. 5/4 cm is 2 x 3 m. The surface is white, even. Area No. 5/2 cm is just 1.5-2.0 m in all. Its surface is uneven, with large mounds (up to 20-30 cm high).

Over area No. 5/1 cm there is a lake with water 40 cm deep. Shavings lie on its bottom in an even layer, underneath the shavings is a level ice surface. The other test areas are considerably higher than the surrounding ice. A lake up to 65 cm deep has formed around them. The bottom of the lake gradually rises from the outer banks toward the experimental areas. An even layer of shavings lies on the bottom of the lake. The ice hole between these areas has melted strongly and has become conical. The banks of the lake have melted considerably from below and cornices 0.4-0.6 m wide hang over the water.

4 August. Rain; the air temperature is positive. Icemelt has begun again. Water has appeared on the high places; this is water that has not been able to drain off into the pools. During the day the ice has melted 4 cm - this is the greatest melting observed during the whole period of observations. The ice on the pools has melted.

5 August. It rained all night and morning; the ice is melting. Because of the rain and intensive thawing, the disrupted layer of ice has disappeared on the high places. The ice is strong on the exposed surface, it consists of columns projecting like a brush. On the ice one can clearly see a network of surface thermal cracks up to 3-5 cm wide, running in different directions. A pole can be shoved down 0.5 m into the cracks. Crack No. 1 has contracted and the year-old ice has hummocked to a height of 2 m.

Due to compression, the airfield on the year-old ice has broken up; a new crack (No. 9) has run through it, all that remains is a strip 280 m long.

6 August. For purposes of comparison, a survey was made of the two profiles (along the axis of the test area and parallel to it on natural ice 80 m from the first profile); at the same time a borehole was made and the ice thickness measured. It was found that on the test area the ice relief was considerably evener, pools were encountered less frequently and they were shallower; the ice thickness did not change much with distance. On the natural ice there are many pools thoroughly thawed. Thus, the artificial methods undertaken for preserving the airfield area during thawing proved themselves completely.

8 August. It has become cooler, melting has slowed down. Again there is a layer of disrupted surface ice; it consists of broken and melted ice granules. In these past days we have noticed a strong development of cornices on the banks of the pools, the depth of which has also increased. The wind prevents the formation of ice on the pools, since the ice crystals are carried to their windward shore. There is hummocking at crack No. 1.

9 August. The areas with shavings were surveyed. Of the areas, only a small segment 2.0 x 2.5 m remained of No. 5/4 cm. It looks like a mushroom. Cornices up to 1.0-1.2 m wide hang over the edges. On the remaining space, a lake 50-70 cm deep has formed. Its banks are also hung with cornices up to 1 m wide and break off when stepped on. The ice reaches a thickness of 5-10 cm in places on the bottom of the lake.

All test areas are covered with a layer of snow 1 cm thick. The pool over these areas is up to 40 cm deep.

10 August. Snow has fallen all day and has covered the ice and the pools in a thin layer.

15 August. A warm day. The fallen snow, which covered the ice unevenly, is melting. The surface of the ice has assumed a motley hue. The high places and mounds are covered with a thin layer of snow of grayish

color (1,0-1.5 cm). White spots of snow appear between them, accumulated in the low places (layer thickness 10-18 cm); the ice on the pools is of a grey-greenish-light bluish color, the leads between the floes appear black.

The fallen snow has smoothed out the microrelief of the ice surface.

On the pools the ice is murky, with a large number of air bubbles, it is porous, friable, consisting of frozen snow and water, tiny mounds of water-permeated snow that has frozen rise above its rough surface. Narrow leads are also covered by a snow ice of this kind. The water temperature in the pools is positive; probably the hothouse effect is in operation.

There are small broken pieces of ice on the pools, floating; they are 2-3 mm lower than the ice which is connected to the banks and which has a slight overhang, since the water level in the pool, apparently, has dropped somewhat.

The ice under the snow is becoming stronger and a pole cannot be forced down as far.

19 August. After several days of warm weather, thawing is again taking place. The snow has melted off the high places, and the surface layer of ice consisting of little columns, freezing from below, has again begun to disintegrate. Once again a loose layer of ice granules has formed on the ice. They are not uniform in size: on the surface the granules are smaller (1.0-2.0 mm), they get larger with depth.

This disrupted layer and the snow remaining in low places masks all depressions and cracks, and it has again become dangerous to walk about on the ice.

The surface of the spring airfield, smoothed with snow, has become quite even; the surface of the year-old ice has also been smoothed with snow with which the cracks and holes on the ice are also covered, so that they are hard to detect. A pole can be shoved down 15-20 cm into the ice layer. On the spring airfield, the old crack is masked with snow, under it is water. The water level is 10 cm lower than the surface of the snow.

A lake has formed on the test areas with shavings; the ice on the bottom, where there used to be a thin layer of shavings, has thawed and small slippery thaw patches have formed. The ice hole formed earlier has become much larger. Only two parts of the experimental area remain (in the form of ice mushrooms with cornices hanging over the water), total area 2 x 2 m.

The remaining test areas can scarcely be distinguished from the surrounding ice. There are fewer pools on the drained areas. These are covered with an ice crust, which is gradually melting. The streamlets between the pools have been filled in with snow and are invisible.

The year-old ice is very fragile; the drill passes through it easily and takes only in the lowest, freshly frozen layer, and some force is necessary to overcome its resistance. The leads are covered with a fragile ice layer 3-4 cm thick. In the lower part, it consists of frozen crystals in the form of needles and platelets oriented in different directions; a murky ice with air bubbles has formed between the crystals. In the upper layer there is murky snow ice.

20 August. Slight frost, thawing has ceased. The ice has become stronger at the surface, it doesn't break as readily when walked on. An ice crust 1.0-1.2 cm thick has formed on the experimental pool which had been cleared of ice.

The ice on the pools has frozen and become more durable. It consists of two layers; snow ice above, platelets of ice up to 5 cm long below, congealed into thin slabs (Fig. 19). When warmed slightly, as when held in the hand, these slabs easily separate into platelets. The slabs freeze together at various angles in the plane, perpendicular to the surface of freezing. Between the slabs there are interlayers of murky ice with air bubbles.

Rime has settled on the surface of the pools.

25 August. Autumn has begun. The disrupted surface layer of ice has hardened and no longer gives underfoot. There is ice up to 5-6 cm thick on the pools, it is covered with snow along the edges. There are spaces between the ice and the water level. The ice, as it were, hangs over the water. The freezing of ice in the pools proceeds more slowly under the snow. In some of them, the ice is settling under the weight of the snow, and cracks are forming along the edges.

As a consequence of driving wind, the spring airfield has completely broken up. Large open leads have appeared north of the field on which the camp is located.

27 August. The open leads in the north remain: a hydroplane can land on them. The transition to autumn is becoming more noticeable. The ice is strengthening from the surface. The temperature of the ice in the upper layers is beginning to drop; the cooling of the ice is slowly spreading downward. The ice on the pools is getting thicker although the water temperature in the pools is positive during the day. They are drifted over with snow along the edges.

30 August. Slight snowfalls and drifting snow are gradually leveling out the surface of the floe. Snow is accumulating in the low places and along the edges of the pools, at the cornices. In places the newfallen snow is 10-15 cm thick. There is no snow on high places and mounds since it is blown off such places by the wind. On the pools the ice is 6-8 cm thick; it will support the weight of a man. In places, under the weight of the snow, the ice has bent and cracked; water has come to the surface and flooded the snow.

The leads at the edges have begun to be covered with ice; nearer the center the wind prevents the formation of a continuous cover, driving the slush, sludge and pancake ice that form to the edge of the floe. Small leads have been completely covered with ice. The lead remains in the north.

31 August. The lead to the north has contracted. There is no place for a hydroplane to land.

1 September. Winter day, air temperature -6°. Strong wind. Snow drifting. The snow is being blown off the elevated sectors; they form gray spots on the white background. Tiny sastrugi have appeared on the snow surface.

The pools are almost solidly filled in with snow; it is difficult to distinguish them; drifts level with the banks of the pools have drifted up against the cornices (height of snow 15-20 cm). The ice is slowly becoming thicker under the snow. The ice thickness does not increase at all in the /hydrologic/ wells on the experimental pools; these holes are cleaned out daily; snow blows into them, and a gruel of weakly congealed snow, permeated with water, forms on the surface. Snow-free sectors still remain in the center of large pools.

In crack No. 1 the ice has reached a thickness of 5-7 cm and supports the weight of a man.

6 September. It has been snowing several days in a row. The first snow-banks have formed around various obstacles. The surface of the ice has assumed a winter aspect. There is no snow on high places; in low places it is as much as 25 cm deep. In places, when the snow is walked on, a brine appears and the snow quickly becomes soaked. The holes made in the ice of the pools do not freeze under the snow. As before, the ice in the pools sags and presses on the water under the weight of the snow. The ice breaks when struck, and the emerging water moistens the snow. The snow-free sectors of the large pools are becoming smaller. The disrupted layer of ice on the mounds is melting because of solar radiation and is covered with a crust up to 0.5 cm thick. Microsastrugi are forming on the surface of the ice; they look like tiny ripples on the surface of water. The depressions between them are filled with snow.

Heavy hoarfrost is settling on objects; a thick layer of glazed frost is freezing on from the windward side.

A vertical section of the pool was made. Above, the snow is 2-3 cm thick, a double layer of ice lies below it. The upper layer is 15 cm thick and consists of snowy, weakly congealed ice which can be penetrated easily with a spade. The lower layer is 10 cm thick, friable, consisting of platelet-scales, weakly congealed into sheets. These sheets in turn have frozen together in various directions in a plane perpendicular to the plane of freezing. The ice platelets, up to 1.5 cm long, grow from below. The platelets are close together in the upper part of the layer; there is

water between them farther down. They break off easily when touched. Between the two layers there is an interlayer of water 1-2 cm thick. Lower down in the cross section there is a water layer about 16 cm thick.

The bottom of the pools reminds one of stalagmites in caves. Ice crystals have melted and stick up like a brush (Fig. 20). A pole can be shoved 30-35 cm into such a layer.

7 September. Boreholes were made and the ice thickness measured. The upper layer has frozen from below and become stronger; it resists the drill almost as well as the winter ice. The lower layers are much easier to bore through.

The cracks along the road to the test areas have sealed, the ice is slightly hummocked. All cracks on the ice are hidden beneath the snow. The lead on the road to the airfield has frozen over; 10 cm of brine has appeared on the ice; it is dangerous to walk on the ice.

10 September. It has been snowing for several days and the snow has covered all the ice. On high places the snow is 1-2 cm deep, on the low places 30 cm. On the pools ice freezing has slowed down; in the center the snow is 10 cm thick, along the banks 30 cm; the ice is as much as 20 cm thick; the water level does not vary. As before, the bottom of the pools has the appearance of stalagmites. The water temperature holds at around -1°; there is practically no diurnal variation. Snowdrifts are massing around objects on the ice.

11 September. An attempt was made to investigate the lead situated to the north of the old field. Almost all the lead is covered with snow; ice was visible only in the middle. The ice broke when we attempted to go out on the lead. It is a weakly congealed snowy gruel, covered from above with freshly fallen snow 20 cm thick. Such ice can be penetrated easily with a sharpened wooden stake.

13 September. The pools on the experimental areas are filled with snow even with the banks. The snow is becoming more compact and almost supports the weight of a man. The pools are hard to distinguish on the year-old floe. The upper layer of ice, 20-30 cm thick, situated directly below the layer of ice which consists of little columns and which was disrupted by melting, has become strong; farther down the ice is still weak, not frozen through, permeated by water. The freezing is gradually increasing in depth. The ice on the pools has become 25 cm thick; water appears in the breaks and moistens the snow.

19. September. Snow continues to level out the surface. The first sastrugi have appeared.* The ice thickness on the pools has increased to

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*This is what text says, although the entries for 1 and 6 Sept. already mention sastrugi (D.K.).

30 cm; the layer of water consists of just 10-15 cm; as before, the bottom consists of stalagmites.

Last evening work was begun on flooding the pools to level out the relief of an area on the old field near camp; specially prepared pumps were used. In half a day we did not succeed in flooding the big pool, obviously the water is draining out under the ice imperceptibly through some cracks. Next we flooded rapidly several small isolated pools. This morning it was found that the water had drained out from them as well. In the pools there remained only slightly frozen snow which had been moistened with water. It was decided to carry out the flooding gradually instead of all at once: first the snow would only be moistened to "cement" all the cracks that join the pools with the water under the ice; then the flooding level would be raised gradually.

Today work was begun on the preparation of snow bricks for winterizing the living quarters with the aim of insulating against the coming winter.

The pools on the year-old ice are covered with snow; the surface of the ice has become level. The cracks have frozen over, and can be walked across easily. The hummocks are covered with snow.

21 September. The moistened snow on the pools that were flooded on 19 September has not frozen through. We have to wait for the coming of frosts. A cross section was made at the shore of the pool (Fig. 21).

29 September. The thermometers used to measure the water temperature in the pools were chopped out of the ice. The bulbs of the two lower thermometers were in water, the upper in ice (distance from the lower boundary of the ice to the bulb 5 cm). In the periods that followed this thermometer was used to record the ice temperature. According to the /rodnikovyi/ thermometer,* the water temperature in that pool was -1.3°. A sample of the water was taken for a salinity test. The measurements were made in a round isolated pool 8 x 8 m. At the observation point it was 45-46 cm deep, ice thickness 36 cm (of this 6-7 cm consisted of snow ice). The snow was 23 cm deep on the ice.

At the same time, the water temperature was taken along with a salinity sample in a large pool that was connected with crack No. 3 during the summer. The water temperature was -0.1°.

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*A mercury thermometer for measuring water temperature. The thermometer is hermetically sealed in a metallic case with a screw on the bottom. The reservoir is covered with copper filings to increase the thermal inertia and to preserve the readings when the thermometer is taken from the water. /Description taken from Khromov and Mamontova's Meteorologicheskii slovar', Leningrad, 1955, p. 324. What would the English term be? D.K./

2 October. Work on flooding the area was continued. As before, the water leaked out from the pools at night, by morning a little water remained together with moist snow. The snow does not freeze well, since the air temperature remains above -10°.

8 October. The area was flooded again in the evening. Air temperatures have dropped to -15°, -20°, which has speeded up the process: during the past 24 hours a layer of snow 8-10 cm has frozen through; below there is moist snow.

The rime, which covers the instruments in a thick layer, is causing considerable trouble. It has to be removed every day.

The ice thickness on the pools is increasing slowly. Tyndall figures have appeared on its surface, they are up to 5 cm high in the shape of fern leaves or frost patterns* (Fig. 22).

Work was continued on the airstrip area, ice mounds were leveled. They were blown up with small charges of ammonite. The boreholes were not made vertically, but at an angle of 40-50° to the surface of the ice. This method proved itself, since holes were not left in the ice after the charge was set off, the charge acted as an ejector, and the explosion broke up and weakened the higher-lying sheets of ice quite satisfactorily. The broken ice was carted off from the area on travois poles and on sleds.

18 October. The pools which had been flooded froze to a depth of 40-50 cm. The surface of the area has become quite level.

19. October. Boreholes were made and the ice thickness was measured on the frozen leads. The following data were obtained:

Borehole Number	Location of Hole	Ice Thickness (cm)	Snow Thickness (cm)	Water Level in hole (cm)	Comment
1	Near edge of old field	61	13	-5	Water level lower than surface of ice
2	10 m from edge	49	4	-	Water hardly came to surface of ice
3	ditto	48	5	-	Borehole 100 m from borehole No. 1
4	Middle of lead	39	7	+1	Water level higher than level of ice
5	ditto	39	8	-2	Borehole 100 m from No. 4; water level lower than surface of ice.

*Like spruce needles. A pattern of parallel lines with short lines branching off at an angle. (Translator's note).

The surface of the lead is level, in places small swellings are encountered. The ice is weak; it is easy to bore through; there is snow ice in the upper layer (Fig. 23).

20 October. The surface of the broken spring airfield on the year-old ice is completely level. Thickness of snow 2-4 cm, under it a layer of disrupted ice (10 cm).

As boring showed, the ice has frozen to a depth of 90-95 cm; below, the ice is weak. The old ice has frozen through and has become strong to a depth of 1.5 m; deeper down it can be bored through easily.

21 October. A section was taken at the experimental pool; depth 66-67 cm. Ice thickness 51 cm. Water has come to the surface of the ice. The distance from the lower surface of the ice to the bottom is 16 cm. 5 cm of ice has formed on the hydrological well in the pool; this well is cleared of ice every day; above there is snow (13 cm). The ice has two layers: the upper layer (2 cm) is solid, of columnar-platelet structure, with occasional air bubbles; the lower layer (3 cm) is of the same structure, but not as strong, with a large number of large air bubbles (up to 0.5 cm in diameter).

22 October. A cross section was made at the same experimental pool; the pool proved to be 71 cm deep. The difference in depth as compared with yesterday's observation can be explained by the unevenness of the bottom of the pool, which consists of continuous stalagmites; consequently, if the rod is moved slightly a difference in depth is recorded. When the well was made, water came out onto the surface and moistened the snow. Ice 4 cm thick grew in the well (cleared of ice daily) in the pool; 7 cm of snow. The ice consisted of two layers, as in the case of the cross section made 21 October.

Recently there has been heavy rime; it covers various objects and settles on the snow surface in a thin layer.

24 October. Cross section taken at the experimental pool; depth 69 cm. Ice thickness 51 cm. A new layer has formed on the ice from the water that came to the surface on 22 October. In two days, the ice grew 13 cm in the center of the well. Along its periphery the ice is 20 cm thick; thus the lower surface of the ice at the well is not horizontal but is arched. The ice consists of two layers: the upper layer (5 cm) is strong, monolithic; the lower layer is of columnar-platelet structure with a sprinkling of air bubbles.

The water temperature in the pool proved unexpectedly high: $+0.6^{\circ}$ (for the sake of accuracy the readings were taken twice, thermometer correction 0.0°). For a comparison with the large neighboring pool (see data for 29 September) water temperature was measured, it proved to be -0.9°. The water level in the large pool was lower, depth 50 cm. The ice (of snow origin) and the snow is 40 cm higher than the water level (ice 12 cm, snow 28 cm).

25 October. 6 cm of ice has grown in the hole at the experimental pool in 24 hours.

26 October. Much time and labor was expended in constructing the experimental area for the airfield. The flooding and leveling of the mounds has produced an excellent level surface. A new crack (No. 10), which formed on the old field has cut the airstrip area into two parts (550 and 350 m). Crack No. 10 runs across it and the cryologists' areas, joining cracks No. 1 and 7. Thermometer areas Nos. 1 and 2 were on different sides of the crack. A gangway was thrown across it so that crossing could be made. The electric thermometers at area No. 2 were at the crack itself. Ice is hummocking along the edges with much noise.

The part of the crack running through the airfield was filled in with snow and pieces of ice, tamped and flooded with water. Constant watch is kept on it. The crack is not spreading. Two airplanes managed to land at the experimental airstrip. According to the pilots Titlov and Osipov, the surface is good.

27 October. Frost. The ice has hummocked in places at crack No. 10. The hummocks have reached a height of 1 m.

A well was cut in the experimental pool. The water level has dropped. Obviously, part of the water has drained into crack No. 10, which is 30 m from the pool. Beginning at water level the depth of the pool is 51 cm, ice thickness at the periphery of the well is 37 cm (33 cm below water level). The ice in the center of the hole consists of two layers: the upper (7 cm) and the lower (3 cm). There is a layer of air between them. The second layer of ice, apparently, was formed after the water level had dropped. The water temperature in this pool is +0.6° (measured twice), the water temperature in the old pool -0.9°.

28 October. A cross section of the experimental pool was made: depth 57 cm, ice thickness 41 cm (37 of which were below water level). Snow ice, 30 cm. Ice 5 cm thick grew in the well. Water temperature +0.6°.

Crack No. 10 is slowly contracting and expanding. Ice has frozen 18 cm deep in the well. When the well was opened, the water rose. Near the second thermometer area it was approximately 0.5-1.0 m wide. The edges were displaced 4 m /with respect to each other/.

30 October. A cross section was made of the experimental pool. Ice froze 18 cm deep in the well. When the well was opened the water rose. Depth of pool 51 cm; ice thickness 45 cm (41 of which were below water level).

1 November. New cracks formed on the old ice, although no compression of the ice was apparent.

7 November. A narrow crack ran from S-N between the thermometer and meteorological areas. The crack is not "breathing".

10 November. Recently the temperature has dropped to -36°. Little snow. The sound of cracking ice can be heard constantly. Thermal cracks have formed in many places.

Rime is settling all the time in large amount. The instruments have to be cleaned regularly, there is a special lot of trouble with the actinometric instruments. The pools are freezing to the bottom.

11 November. Today everyone was awakened by the roar of hummocking, reminiscent of the thunder of surf against a rocky coast during a storm. The wind is weak, but intensive compression is taking place around the old field and there is hummocking of the year-old ice. In various places the crash of breaking ice can be heard and jolts can be felt. It seems as if the ice is breaking up under the tent.

The crack between the thermometer and meteorological areas is not expanding.

The year-old ice has broken and hummocked at the spring airfield. From the base field it can be seen that a number of new hummock ridges have formed there. From a distance we can see how quickly they grow, the floes on top tumble down and immediately new floes are pushed out and amass. Intense hummocking is also taking place at crack No. 1. Hummock ridges of year-old ice up to 3 m high are being squeezed out onto the edge of the old field. Due to the increasing weight, large pieces are breaking off from it. All the old field at the boundary of the year-old ice has broken up, a mass of cracks can be seen. Water has emerged in places on the ice which have sagged under the weight of the hummocks. The ice hummocked the whole day. Freezing weather, down to -38°. The floe on which the camp is located has become considerably smaller.

12 November. The snowstorm which had begun during the night is getting stronger, but the thunder of hummocking cannot be heard.

The large temperature gradient in the upper layers of the ice cover, caused by the sudden cold weather, has brought about great stresses in the ice cover.

18 November. Despite the strong wind, which has been blowing for several days, there is no hummocking. The cracks have sealed and are covered with snow; in places it is even hard to find them. The snow has become more compact, harder. Large snowdrifts have built up in the camp area.

20 November. The blizzard has lasted three days. The snowdrifts in camp are growing rapidly. The cracking of ice can be heard constantly.

27 November. Borings were made in the old field. It has frozen through completely, become strong and begun to grow. The pools are completely frozen.

Althcugh the wind is weak, the noise of ice hummocking can be heard in the west at the lead. Large hummock ridges up to 3 m high are massed around the base field.

30 November. The ice was bored at the test sectors. The year-old ice is entirely broken up and cross-hummocked.* A ridge of hummocks has passed thrcugh the test areas under which all boreholes have been buried along with the stakes and benchmark No. 2. Cnly a small part of test areas Nos. 1 and 2 remains, on which we managed to make three new holes for measuring ice thickness. The remaining part of the test areas were moved and brought nearer the base field.

3 December. The ice is 3 m thick at the place where the new series of electric thermometers have been set up (area No. 3). There is no snow on the mounds. In general there is little snow on the surface of the floe, it accumulates in the low places and on the pools, where it reaches a thickness of 20-30 cm.

10 December. At night near the base camp we could hear the rumble of breaking ice. The floe could not be examined because of the darkness; the moon was hidden.

13 December. In the evening a loud cracking sound could be heard again, as when cracks form. An examination of the field near the camp with a "Bat" (Letuchaia mysh') lantern showed no new cracks. To the west we saw a frozen lead up to 50 m wide. The snow cover was unchanged. The snow was compact in the drifts between the tents, it was hard to dig into them with a spade.

22 December. The old field has turned counterclockwise to a considerable extent.

The lead 300 m west of the camp was examined, it is at the boundary of the old and the year-old fields. The object of the examination was to determine the possibility of using it as an airfield. The lead, forming a slight arc extends for a great distance. It is 30-40 paces wide at its narrowest spots. The ice on it is level, 74-88 cm thick, small hummocks are found in places on the sealed cracks. A layer of snow 4-5 cm thick, consisting chiefly of accumulated rime, lies unevenly on the ice, in small mounds. A hummock ridge 2-3 m high, comprised of fragments of year-old ice stretches along the edge of the old ice. Low hummocks of autumn and year-old ice can be seen at the edge of the year-old field. The year-old field is broken up and cross-hummocked in many places.

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*Possibly "re-hummocked". Hereafter in the text this term will be starred. (Translator's note).

It is impossible to use the lead as an airfield because it is not wide enough and there is a ridge of hummocks along both edges. Besides, a great deal of work would be necessary to construct an airfield, the small hummocks at the frozen cracks which intersect the lead in many places would have to be leveled.

Water has appeared on the floor of the meteorologists' tent, the water is slowly becoming deeper. The tent had been set up on a pool which had not frozen to the bottom. Meanwhile snow had drifted right up to the top of the tent. Probably the ice over the pool had sagged under the weight of the snow and the tent with its equipment, and the unfrozen water in the pool had come to the surface.

23 December. The year-old ice is growing, it has become 1.6 m thick; by the end of the thaw period it was only 90 cm thick in all. There is little snow on the ice; it accumulates chiefly on the pools and the hummocks. The ice mounds have become bare and are covered with a layer of rime 1-2 cm thick. Under it is a layer of disrupted granular ice.

There have been no movements and hummocking in the past days. Fresh surface cracks of thermal origin are to be found on the floe where the camp is located. During the night hours a very beautiful colored polar aurora was observed in the form of rays and drapery. The form of the rays and the hue of the aurora changed continually.

30 December. The snow cover on the ice is unchanged, the snow drifts about with the wind. Snow does not fall, but a layer of rime settles every day. A snow-measuring survey was carried out at the thermometer area.

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3 January. From time to time the crash of breaking ice can be heard. Apparently, thermal cracks are forming, but none have been discovered in the vicinity of the camp.

4 January. A blizzard set in at the beginning of the day; the moon is hidden. A little snow has accrued in the low places on the ice.

7 January. The air temperature has dropped to -45°, wind 5m/sec. All mercury thermometers have gone out of commission. The noise of breaking ice can be heard constantly.

9 January. A storm without snowfall has begun; snow is drifting. The crash of breaking ice can be heard constantly.

14 January. Temperature down to -50.1°, wind 4m/sec. It is difficult to work outdoors.

17 January. The crash of breaking ice continues. A band of weak twilight has appeared in the sky. You can walk around at midday now without a lantern, although visibility is poor. The beaten paths can scarcely be distinguished against the general white background.

On the year-old field, near what remains of the test areas, the ice was bored to determine depth. It was difficult to find the work areas, although the moon cast some light. The ice is all hummocked and drawn away from the old field. Between the fields a lead has formed up to 200 m wide, covered with ice 50 cm thick and forming an excellent airfield. The ice is smooth, very lightly coated with rime. No additional work is necessary in constructing the airfield. The lead had formed, obviously, at the end of the December or the beginning of January, since it had not existed at the time of the previous boring.

There are hummocks up to 3 m high on the year-old ice which is 180 cm thick. The old ridge of hummocks at the test areas turned into smoothed ice mounds during the thaw period.

20 January. Boring showed that the ice had reached a thickness of 115 cm at the western lead (formed 13 December); the layer of rime was 2-3 cm thick. The cracking of ice can be heard constantly in the camp area.

21 January. The twilight is getting stronger.

29 January. The ice has been breaking day and night to the south of the base field. Wind weak. Apparently the ice is breaking up right alongside the tents. The thunder of compression and hummocking of the ice reminds one of artillery fire. The lead discovered on 17 January has disappeared. A pressure ridge has formed on the year-old ice and is slowly descending on the field where the station is located, breaking off and crushing pieces of ice. During the day the edges of the floe have broken off along 40 m, and the distance between the edge of the pressure ridge and the camp is only 400 m.

31 January. At night intense compression and hummocking of the ice began again at the old place accompanied by great noise. The impacts of the pressing ice floes can be felt clearly through the ice. The impacts can be felt even in the tents and make the electric lights swing back and forth.

Toward the end of the day the wind increased from the northwest quadrant. The noise of hummocking ice and the jolting have ceased.

1 February. The twilight is getting brighter every day. It now remains about 6 hours.

4 February. Two cracks appeared in the camp area at 0330 hours (Nos. 11 and 12); they divided the camp and cut off the remainder of the field and the airfield. The base part of the camp rests atop an ice wedge formed by the cracks.

Crack No. 11 ran from the old work tent of the cryologists situated 250 m from the camp (where in summer a shaft* was cut into the ice) in a SE-NW direction, near the master tent (Fig. 24), through the tent with the magnetic variation station right up to the living quarters of the magneticians, separating it at its entrance from the rest of the camp. The shield of that tent, made of snow bricks toppled into the crack. Further the crack ran through the astronomical pavilion and the work tent of the cryologists, tearing it in two and cutting off the test area and the snow house from the camp. The shield of the snowhouse hung over the water. In the process the wires connecting the actinometric instruments with the automatic recorders were broken. Further the crack ran near the gradient mast and cut it off, along with the meteorologists' work area, from the camp. At first the crack was not more than 30-50 cm wide, which made it possible to save almost all the equipment.

Crack No. 12, up to 3 m wide, ran from E-W, from the end of the flooded airfield (from the eastern end of the floe) through thermometer area No. 2, near the radio station and the living quarters of the hydrologists, past the meteorological area where it joined crack No. 11. Crack No. 12 separated the camp from the flooded airfield, the store of provisions, the gas cylinders and the two tents of the hydrologists. Furthermore, the windmill and both radio masts were broken; their guy lines landed on the several fragments of the floe. Radio communication was cut-off for a time. The drifting station lost its windmill, which was used both for radio communication and for lighting the tents.

Several small cracks also formed. In particular, a new crack No. 13 formed a bend at the junction with old crack No. 3 and perpendicular to it, near the former site of the work tents of the hydrologists and, further, a narrow crack across the airfield. In the vicinity of the camp, the ice settled immediately under the weight of the drifts after the crack had formed, and water emerged from the cracks moistening the snow.

Salvage operations were completed only in the evening. An intensified watch was kept that night. The crack slowly "breathed."

5 February. A small strip of twilight appeared on the horizon in the morning, at midday it was almost completely light. In the examination made during daylight it was found that the entire floe was broken up, that cracks ran in all directions. In places they were 30-50 m wide.

Of the airfield only a strip 200 m long remained, the rest was broken up into fragments. The cracks are "breathing." The thin ice which had formed in them is continually breaking with a crash. During the night the

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*Holes were cut in the ice for the removal of the ice blocks to be tested for strength, etc. Often 2, 3 or more blocks were taken from a single opening, since the ice was 3-4 m thick. The Russian word used is "shurf", a mining term meaning "trial pit", "excavation" or "shaft". I have arbitrarily chosen "shaft" (D.K.).

surrounding region was examined several times, using rockets for illumination. No new cracks were found.

6 February. The sound of breaking ice was heard at night south and west of the camp. No new cracks in the camp area. Crack No. 12 is slowly "breathing."

7 February. Blizzard. Often the roar of breaking ice can be heard. A reconnaissance was made of the ice field in the camp area (Fig. 25).

8 February. Small hummocks have formed to the north along the cracks. The crash of breaking ice can be heard continually.

12 February. A blizzard has begun.

13 February. The blizzard has died down.

14 February. In the east at night there was the sound of hummocking. Probably young and year-old ice was hummocking at the boundary with the old field. During the night several jolts were felt. Old sealed cracks near the camp burst. Toward morning the wind died down.

In the morning (around 2200 hours Moscow time, 13 February) there was a loud noise, the ice trembled from a jolt. Everyone jumped up and out of the tents. From the strong compression there began a hummocking of the old ice on which the station was located. A pressure ridge formed at its eastern boundary. The terrible thunder of thick ice breaking could be heard continually. The ridge began to advance noticeably toward the camp. Soon a new ridge arose before the first one, and after a short time the ice began to form hummocks at the crack which had appeared 26 October and it passed between the test areas and the camp, in a few minutes a new powerful pressure ridge had formed. Huge ice blocks 3-4 m thick broke off easily from the ice field, rose up under the ridge and heaped up one on the other. The ridge had reached a height of 7-8 m. The ridges moved slowly forward, gradually forming a half-circle in the camp area.

At various places to the south and north, new pressure ridges appeared which seemed continuations of the preceding.

Cracks spread in all directions before the pressure ridge (Fig. 26). Due to the great weighting at the edge of the field, large blocks of ice broke off from it and, under the weight of the ice fragments falling from the summit of the pressure ridge, stood on edge, tipped over, became partially submerged in the water, and finally were buried under a thick layer of fragments. The pressure ridges, moving forward, ground the thick ice field (3-4 m thick) as in a meat grinder. It seemed to break easily, like a thin and brittle shell. This was accompanied by a powerful roar.

The nearest ridge advanced almost up to camp, not more than 30 m away (Fig. 27). A network of narrow cracks spread in front of the ridge. One of them ran alongside the galley and beyond, through the work tent of the magneticians, another under the workshop tent whereby the shield made of snow bricks was split. Many cracks ran beyond the camp in a westerly and northwesterly direction.

The pressure ridges embraced the part of the floe with the camp in a half-circle which slowly closed. There was only one exit - to the west. Work was begun to remove the emergency radio station and part of the provisions and equipment from the threatened zone.

During the day a watery sky could be seen to the northwest. The advance of the pressure ridges from the southeast and east ceased toward evening. The wind freshened, at night a blizzard began, and all the cracks filled with snow.

15 February. The snowstorm continues. The cracks in the camp are "breathing." Due to poor visibility, the state of the ice could not be ascertained. From time to time jolts could be felt.

16 February. The snowstorm has stopped, the wind has slackened. All cracks are filled with snow.

The ice was examined in the vicinity of the camp after the events of 14 February. A series of concentric open ridges surrounding the camp could be seen from atop the nearest pressure ridge. The fairly level field had turned into a sort of "mountain country" (Fig. 28). Between the pressure ridges the ice was intersected with cracks, transverse to the ridges which had formed as a result of strong compression.

The work tent of the cryologists with equipment, which stood at the crack that had formed 26 October, disappeared without a trace, nor was there a trace of thermometer areas Nos. 1 and 2 with the groups of electric thermometers which had been frozen into the ice. Bench marks 1, 2 and 3 and ablation stakes 1, 2, 3, 4, 5, 11 also disappeared. In general, everything that remained on the other side of the ridge was buried under the hummocked ice.

Of the strong old ice field only a small segment (about 200 m in diameter) remained to the west of the camp. But even this segment was not a single floe, consisting of individual fragments between which the ice was hummocked.

The old narrow lead where the borings were made earlier remained to the west and northwest of camp. Beyond it lay a strongly cross-hummocked* field of year-and-a-half ice. At a distance of approximately 1 km from camp we found an old field (more than 1 km in diameter), which was difficult to reach because of the hummocks.

All night the ice broke up in the north and east, near the new radio tent; the sound of hummocking was audible southeast of camp as well.

17 February. The cracks in the vicinity of the camp burst again. The sound of the crash of breaking young ice could be heard continuously. The floe, on the edge of which the snow house with instruments was located, trembled from the impacts with neighboring floes; the indicators on the galvanometers jumped about. It has been decided to move to the neighboring stronger fragment of floe.

18 February. Weather quiet. Compression began about midday. First the young ice at crack No. 12 began to hummock with accompanying noise (at the old radio tent), then the old ice began to hummock along the edges of that crack. The ridges began to move. Crack No. 1 (between the living quarters of the cryologists and the observation areas) began to spread. The work tent, which had been hanging over the crack, at last split in two; the crack parted 2 m. Hummocking of ice from crack No. 12 spread to the work tent of the hydrologists. It froze over solidly and became very heavy. It was difficult to pry the tent from the ice and carry it to a new location.

The compression increased, and the fragments of floe on which the camp was situated, broke into still more pieces (Fig. 29). Several fine cracks formed. One of them ran along the living quarters of the hydrologists, splitting the snow shield at the entrance and further it ran immediately around the shield, the living quarters of the cryologists, and near the living quarters of the meteorologists. The second crack intersected the living quarters of the cryologists, but did not spread, a third rounded the galley, etc. The compression quieted down in the evening.

19 February. No strong compression was observed in the vicinity of the camp. A watery sky was visible to the north. It was decided to relocate the camp on the ice field which had been discovered 16 February to the west. We scouted out possible auto routes to the new floe. In making the road it was necessary to cut through hummocks and to remove snow.

20 February. The most essential material was transferred to the new camp by auto. Three living-quarter tents were set up and equipped.

24 February. These past days have been spent in transferring property and equipment to the new camp. A snowstorm has begun.

25 February. The snowstorm has died down. The roar of breaking ice was heard at night to the east and to the west. Regular trips were made to the old camp to carry out observations.

Three reconnaissance parties were sent out in different directions to find a suitable area for a landing strip. The northern party found a large frozen lead with ice 17 cm thick beyond the neighboring, recently cross-hummocked* old field. Obviously, this lead had frozen at the place where a

watery sky was seen earlier. Maximum width of the lead 1.5 km, it was several km long, stretching as far as the eye could see. The western party found an area 70 x 450 m on winter ice 60-70 cm thick. The distance from the camp to the area was about 3 km, the road very poor. It was intersected by hummock ridges, and the ice was strongly hummocked. The southern party found an area 400 m long about 1 km from camp. In places it was somewhat hummocked, ice thrusts 40-50 cm thick could be seen along the sealed cracks. Much more work would be required here than on the western area.

For the first time a red segment of the sun was visible on the horizon, with emergent rays. At night the sound of hummocking could be heard to the east and west. The sound of breaking ice often could be heard at the new ice field as well.

26 February. Work was carried out on clearing the snow from the automobile road to the old camp. Beginning at 1400 hours the visibility became poor, the snow began to drift.

1 March. The ice reached a thickness of 25 cm at the northern lead; the ice was hummocked in places. Probably there had been slight compression. The site of the former camp was examined in the region of hummocking and pressure ridges (Fig. 30). The whole region, north, east and south, formed a continuous mass of hummocks and ice ridges stretching in various directions (Fig. 31). Small segments of level ice remained between them in places, they had undergone strong compression, with the result that they were covered with many cracks running perpendicular to the ridges. The basic direction of the main, largest ridges was S-N.

A fragment of the southeastern part of the old field was found south of the former camp among the cross-hummocked* ice. On this fragment was a part of the test area with the flooded pool up to 150 m long. When the ridges were formed this fragment was squeezed out to the south and turned clockwise in a SW-NE direction. During compression it crushed the year-old ice, where the test areas were located. As a consequence, a fragment of the area pressed directly against the southeastern end of the ice field on which the new camp was located. A hummock ridge and a band of strongly hummocked year-old ice 150 m wide stretched along the edge of contact /of these two ice fields/ in a SW-NE direction.

Stakes 4 and 5 were found on a fragment of the old field. We could not find the field with bench marks 1, 2 and 3, the work tent and the electric thermometers. Obviously, they were buried under the pressure ridges.

The height of the pressure ridges decreased to 5-6 m due to the settling of the ice under their weight.

On the new field the ice thickness is: 1) 2.1 m in the borehole on the frozen pool; 2) 3.0 m on the level; 3) 3.48 m on ice mounds.

2 March. The roar of hummocking can be heard to the north and northeast.

4 March. The ice thickness has increased to 50 cm at the northern lead. Due to compression a number of cracks have formed on it. An airplane landed on the area prepared here (pilot, I. P. Mazuruk).

6 March. Beginning with the evening of 5 March, the loud roar of breaking ice could be heard from time to time to the south, west and east of the new camp. During the day it was discovered that the new floe had broken into two pieces. A crack up to 0.5 m wide ran for 100 m from camp from NE-SW. A number of cracks also developed on the young ice, in the lead between the old and the new fields (Fig. 32). The old ice-filled crack on the automobile road parted. The ice was 2.6 m thick at the site of the second hydrological well in the new camp.

7 March. The crack near the camp became as much as 5 m wide. The crack on the auto road has reached a width of 8 m, the edges have shifted with respect to each other. In places hummocks have formed.

8 March. Hummocking is taking place on the young ice where the auto road was laid out. The old camp can be reached only across a fresh ridge of hummocks. The crack intersecting the road is "breathing" continuously. In the evening a new crack 5-8 m wide running along a hummock ridge, was discovered 100-120 m north of camp.

9 March. The cracks are "breathing." To the east the ice is hummocking.

10 March. The roar of hummocking could be heard in the west at night. Toward morning the wind died down, but during the day the thunder of hummocking reached us from all sides. The ice is hummocking near the cracks.

A reconnaissance was made of the surrounding region, which was examined by binoculars from a high hummock. The ice is cross-hummocked* everywhere, the floes are heaped up on each other chaotically. The old field to the north of the new camp, along the road to the northern lead where the airplane landed, is strongly hummocked. The hummocking reminds one of that which took place on the old ice field where the camp was formerly located. Ice blocks 3-5 m thick lie on the surface of this field. There are practically no level places around the new ice field. Only to the north of camp can one see small non-hummocked areas around the hummock ridges.

With the coming of night, the crash of breaking ice could be heard in the vicinity of the camp.

11 March. Calm day. Hummocking cannot be heard.

12 March. At 1000 hours the sun appeared above the horizon. The color of the sky was amazingly beautiful: in the north, at the horizon, it was dark blue, higher up pale red, around the sun, reddish. Twilight now persists all night.

A fragment of the year-old ice field with remnants of the test areas was found. The ice all around was also strongly cross-hummocked* (Fig. 33). The discovered fragment was pressed to the southeastern edge of the floe where the camp was located and there was especially strong cross-hummocking* for a distance of 50 m from the edge, along the line of contact with that floe. Many cracks passed around the old boreholes. The ice thickness reached 2.1 m. This fragment was included in old ice, and in the future it will be possible to find ice of different age and thickness in individual segments of that field.

The process of hummock formation from young ice on old thick ice is interesting. Young ice forms during the winter in the cracks in the old ice. With the subsequent compression and congelation, the ridge of hummocks, situated amidst the old field, formed from young ice that was squeezed out to the surface.

In the vicinity of the camp an old crack burst, passing 50 m to the east of the crack that formed on 6 March. The crack parted 5 cm.

13 March. The ice was drilled at bench mark No. 5. The region to the east and northeast of camp was studied. Everywhere there is unimaginable chaos due to the hummocking of ice. In this region there is a mixture of fragments of old, year-old and young ice. If all this were to freeze together in one mass, it would be very difficult to determine its origin. Small fragments of last-year's spring airfield were found on the year-old ice, they were surrounded by hummocks of year-old and young ice. It was definitely established that the work tent, electric thermometers and other equipment had been lost beneath the pressure ridges.

14 March. The ice reached a thickness of 20-23 cm in the crack which formed near the camp on 6 March. The ice was bored in the old lead, between the old and the new camps.

16 March. The crash of ice can be heard constantly. Apparently, thermal cracks are forming because of the drop in temperature.

18 March. The thunder of hummocking can be heard to the north.

19 March. A crack has formed behind the tents of the hydrologists. Many new cracks were found on the ice fragment with the remnants of the test areas.

20 March. Rime covered the ice and the instruments with a layer 1 cm thick. The thunder of hummocking was heard to the northwest.

21 March. The crack which burst on 19 March is "breathing."

22 March. The condition of the ice is unchanged. M. M. Nikitin has completed a reconnaissance of the field on which the camp is located (Fig. 34).

29 March. The area on which Mazuruk made his landing remains, but a crack has run through the middle, along which some ice has hummocked (Fig. 35). An automobile road is being laid out to the airfield in preparation for the proposed evacuation of the drifting station.

1 April. This is the first anniversary of the drifting station.

The state of the ice is unchanged, hummocking cannot be heard. The snow and ice have begun melting south of the tents.

2 April. On cutting out a block of ice in the vicinity of the old camp it was discovered that the ice had undergone strong compression in the period 14 through 18 February and was all cracked. It was marked throughout with tiny cracks running in various directions. The ice breaks up into layers along these cracks, it has become considerably weaker. The upper layer of ice (25 cm), disrupted by the summer thawing, has many airhole-pocks.

In the compressed cracks the ice is raised 1.5-2.0 m in places. The pressure ridges have settled noticeably. There is no snow on the mounds, the ice is covered with a thin layer of rime (1-2 cm).

3 April. The automobile road to the old camp has been cleared. Because of large-scale ice movements, part of the road had to be rebuilt.

4 April. Equipment was carted to the airfield and the field cleared of hummocks. Ice movements began in this area at 0600 hours. The thunder of breaking ice could be heard. The auto road, running across the young ice, disappeared over a segment 1.5 km long. The young ice is hummocking due to pressure. The fate of the airfield and the freighted material is in doubt, since it is dangerous to travel over the hummocking ice and breathing cracks.

5 April. Hummocking has ceased. The auto road and the airfield were examined. The airfield proved to be intact, but the road had been broken up by yesterday's ice movement. The road will have to be laid anew and in places across the old ice. This requires much labor.

Traces of yesterday's compression could also be noticed in the vicinity of the old camp. Ice had hummocked in places along the cracks. Some of the cracks, on the other hand, had parted.

6 April. It is still impossible to run the road to the airfield, since the ice has not yet frozen on the cracks.

7 April. The road to the airfield is being built (Fig. 36). The ice here has reached a thickness of 1 m.

9 April. The state of the ice is unchanged. Observations have ceased because of the curtailment of the operations of the drifting station and the evacuation of the camp.

Figures

Figure 1: Sketch map of the ice field with the drifting station after data from the reconnaissance of 3 May.

A. Actinometric area; T_1 - 1st thermometer area; T_2 - 2nd thermometer area; ' ∩ - Psychrometric apparatus; OY - Test area for observations of the development of the relief; P∩ - Work tent with the automatic recorders; ∩ Ш - Tent over the shaft for extracting ice blocks; 1 - Work area of the cryologists; 2 - Work tent of the geophysicists; 3 - Meteorological area; 4 - Living quarters of the aerologists; 5 - Living quarters of the cryologists; 6 - Living quarters of the hydrologists; 7 - Living quarters of the geophysicists; 8 - Living quarters of the officer in charge of the airfield; 9 - The galley; 10 - Radio-operator's tent; 11 - Food stores; 12 - Windmill; 13 - Stores of gasoline and gas cylinders; 14 - Area for manufacturing hydrogen; 15 - Work tent of the hydrologists; 16 - Radio masts.

Figure 2: Hummocks at the eastern edge of the airfield.

Figure 3: Crack at the airfield.

Figure 4: Hummocking at the airfield.

Figure 5: Investigating the crack by rubber life raft.

Figure 6: Sketch map of the ice field with the drifting station after data from the reconnaissance of 24 May. The dashed lines show the cracks which formed after the survey of the 24th (crack No. 8 on 30 June and crack No. 9 on 5 August).

Figure 7: Microrelief of the surface of the melting snow.

Figure 8: "Ice bridge" in the form of an arch across crack No. 1.

Figure 9: Surface of the year-old ice during the thaw period.

Figure 10: Surface of the old ice during the thaw period.

Figure 11: Draining the meltwater near the camp.

Figure 12: View of test areas with shavings.

Figure 13: Banks of a pool on the old ice.

Figure 14: Test area with shavings. Around it is a lake of water.

Figure 15: Tyndall figures on the ice of a pool.

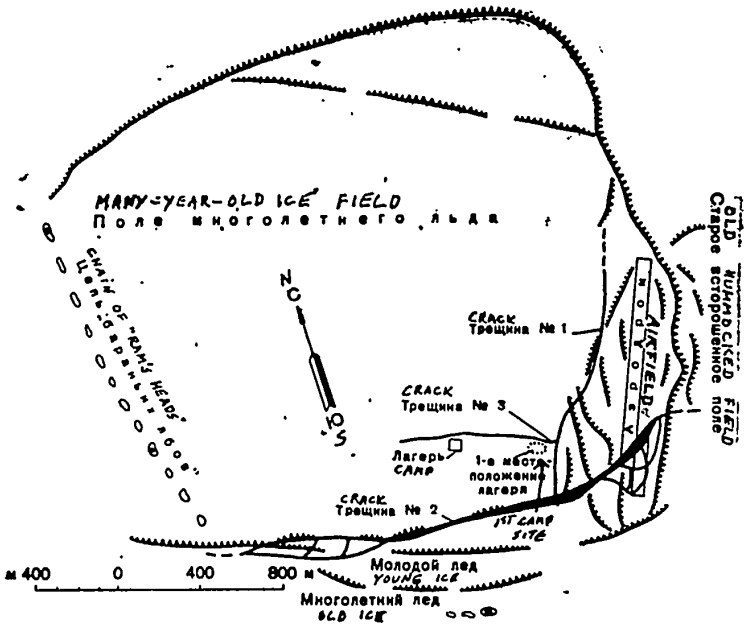
Figure 33: View of hummocks near the test areas.

Figure 34: Map of the ice field in the vicinity of the last campsite, after data from the reconnaissance of 22 March.

1 - Cryologists' area; 2 - Meteorologists' area; 3 - Hydrologists' tents; 4 - Magneticians' area; 5 - Living quarters; 6 - Radio station; 7 - Galley.

Figure 35: Hummocking along the crack at the airfield.

Figure 36: Making the automobile road from the camp to the airfield.



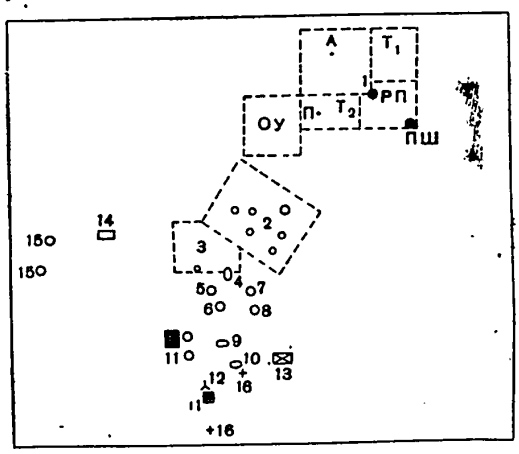


Рис. 1. План ледяного поля дрейфующей станции по данным глазомерной съемки на 3 мая.

А — актиномерическая площадка; T_1 — первая термометрическая площадка; T_2 — вторая термометрическая площадка; *П* — психрометрическая установка; *ОУ* — опытный участок для наблюдений над развитием рельефа; *РП* — рабочая палатка с самописцами; *ПШ* — палатка с шурфом; *1* — рабочая площадка ледоисследователей; *2* — рабочая палатка геофизиков; *3* — метеорологическая площадка; *4* — жилая палатка аэрологов; *5* — жилая палатка ледоисследователей; *6* — жилая палатка гидрологов; *7* — жилая палатка геофизиков; *8* — жилая палатка коменданта аэродрома; *9* — кают-компания; *10* — палатка радиста; *11* — склады продовольствия; *12* — ветряк; *13* — склад бензина и баллонов с газом; *14* — площадка для добывания водорода; *15* — рабочие палатки гидрологов; *16* — радиомачты.

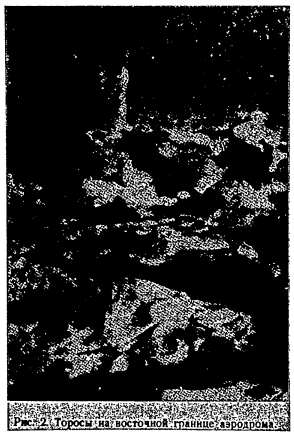


Рис. 2. Торосы на восточной границе аэродрома

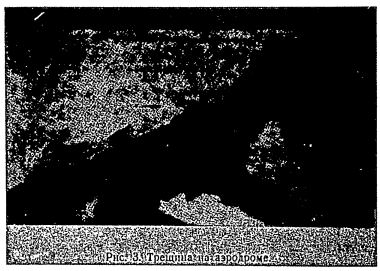


Рис. 3. Трещина на аэродроме

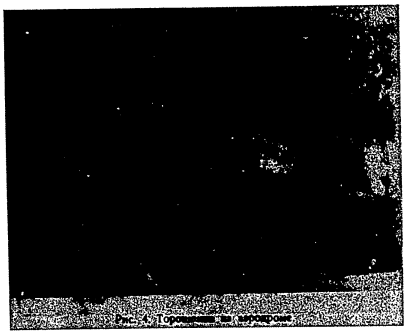


Рис. 4. Трещины на аэродроме

Рис. 5. Обледенение крыши с капиндбота.

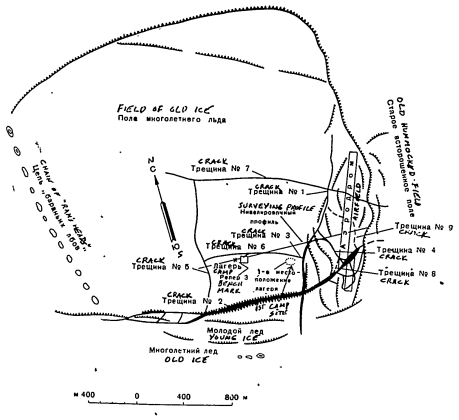


Рис. 6. План ледяного поля дрейфующей станции по данным глазомерной съемки на 24 мая. Пунктиром нанесены трещины, образовавшиеся после съемки 24 мая (трещина № 8 — 30 июня и трещина № 9 — 5 августа).

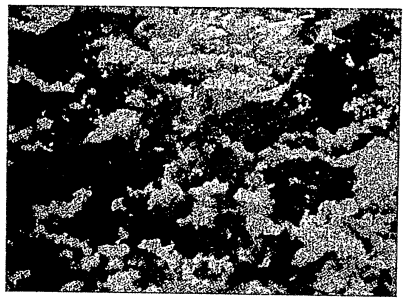


Рис. 7. Микрорельеф поверхности тающего снега.

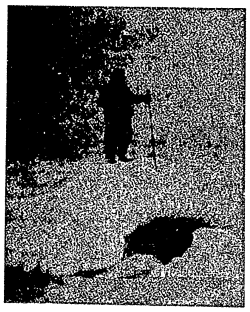


Рис. 8. Ледяной «остров» в виде эрратического валуна на трещине № 1.

Рис. 9. Поверхность однолетнего поля в период таяния.

Рис. 10. Поверхность многолетнего поля в период таяния.

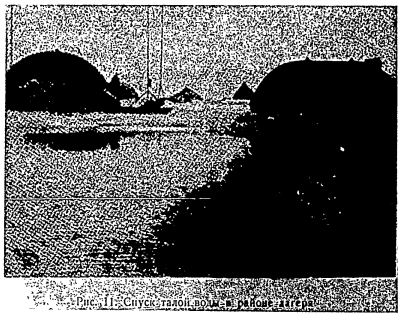


Рис. 11. Спуск талой воды в район затора.

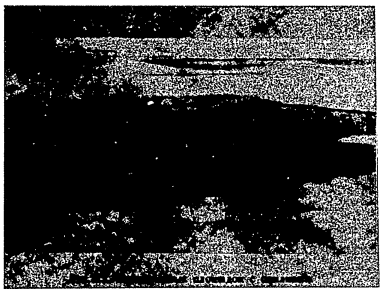
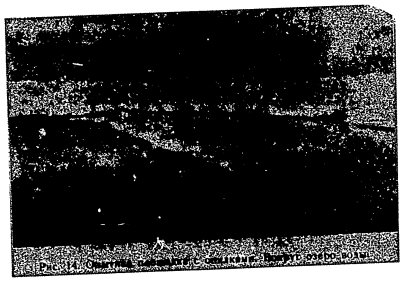


Рис. 13. Берега снежницы на многолетнем поле.



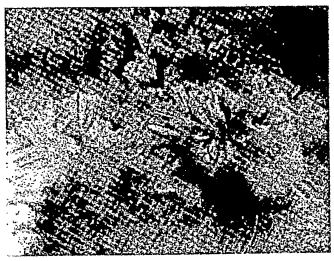


Рис. 15. Ледяные цветы на льду снежницы.

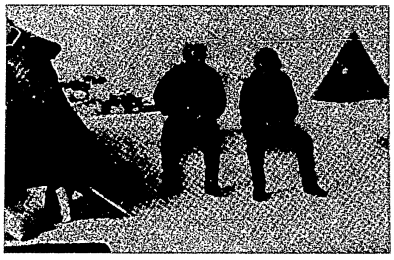


Рис. 16. Ледяной цоколь, образовавшийся под круглой палаткой.

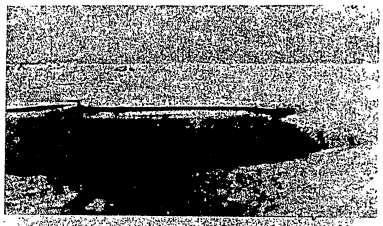


Рис. 17. Образование карнизов по берегам снежниц.

Рис. 18. Нижняя поверхность годовалого льда в период таяния.

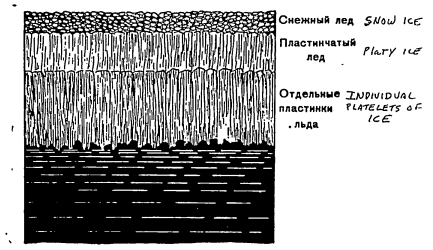


Рис. 19. Разрез льда на снежнице (20 августа).

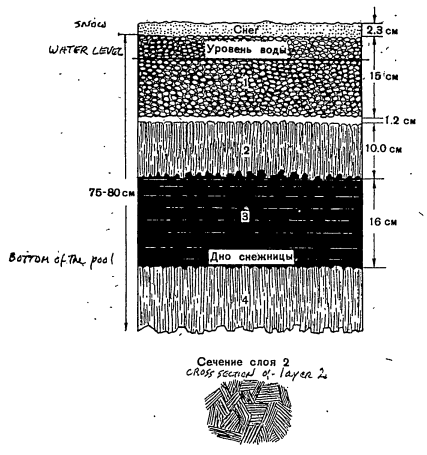


Рис. 20. Разрез льда на снежнице (6 сентября).

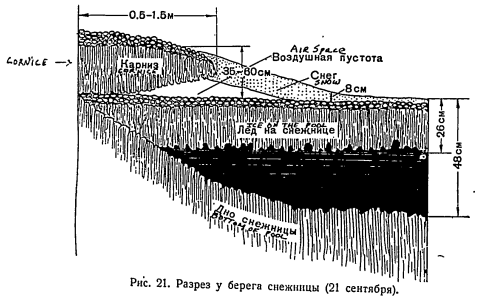


Рис. 21. Разрез у берега снежницы (21 сентября).

Рис. 22. Ледяные цветы на льду снежницы (8 октября).

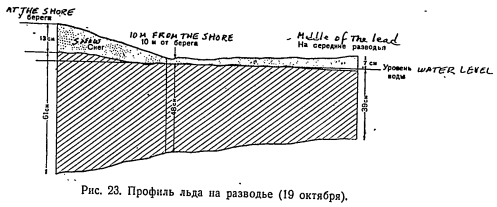


Рис. 23. Профиль льда на разводье (19 октября).

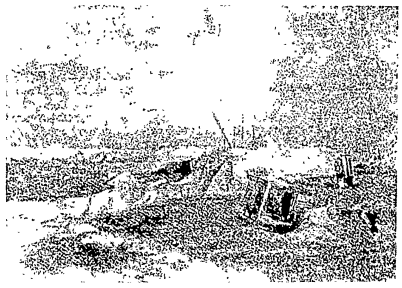


Рис. 24. Трещина около палатки-мастерской.

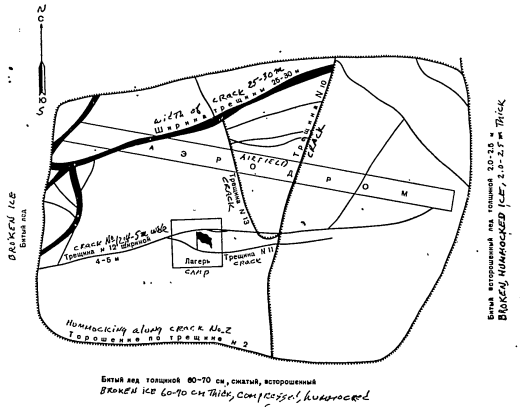


Рис. 25. План ледяного поля дрейфующей станции по данным глазомерной съемки 7 февраля.

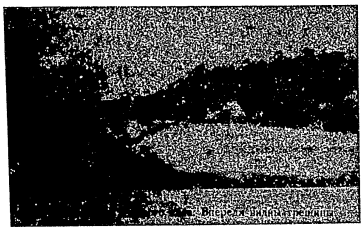


Рис. 27. Ледяной вал в районе лагеря

Рис. 28. Ледяной вал на многолетнем ледяном поле. Слева — перемолотый лед, справа — сохранившийся нетронутым участок льдины.

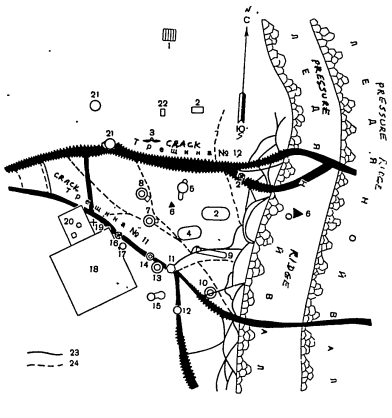


Рис. 29. План ледяного поля дрейфующей станции по данным глазомерной съемки 18 февраля.

1 — баллоны; *2* — склад продовольствия; *3* — ветряк; *4* — жилая палатка; *5* — радиостанция; *6* — радиомачта; *7* — жилая палатка ледоисследователей; *8* — жилая палатка гидрологов; *9* — камбуз; *10* — мастерские; *11* — палатка для вариационных наблюдений; *12* — баня; *13* — жилая палатка магнитологов; *14* — астрономическая защита; *15* — магнитный павильон; *16* — рабочая палатка ледоисследователей; *17* — снежный дом ледоисследователей; *18* — ледоисследовательская площадка № 3; *19* — градиентная мачта; *20* — метеорологическая площадка; *21* — рабочие палатки гидрологов; *22* — туалет; *23* — трещины, образовавшиеся 14 февраля 1951 г.; *24* — трещины, образовавшиеся 18 февраля 1951 г.

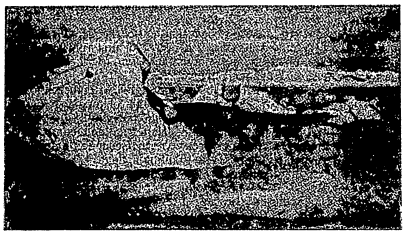


Рис. 30. Вид с ледяного вала подальше

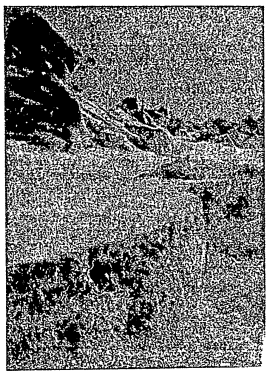


Рис. 31. Участок ледяного вала

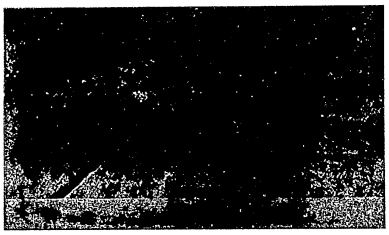


Рис. 33. Вид "торосов" вблизи опытных площадок

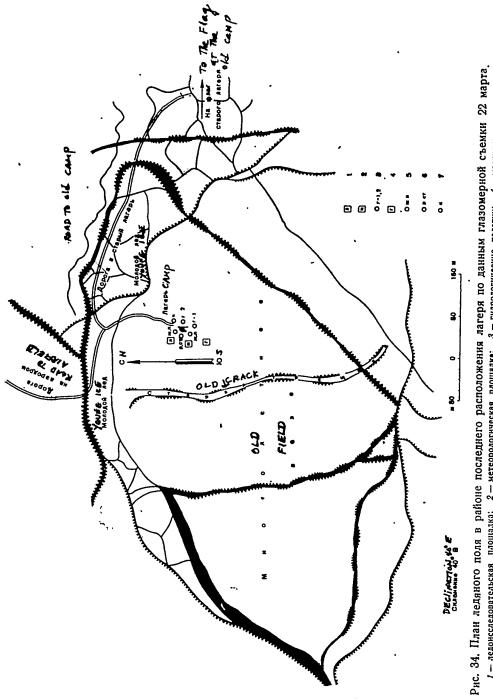


Рис. 34. План ледяного поля в районе последнего расположения лагеря по данным глазомерной съемки 22 марта.
1 — метеорологическая площадка; *2* — гидрологические пункты; *3* — магнитная площадка; *4* — жилые палатки; *5* — радиостанция; *6* — камбуз.

Рис. 35. Торошение по трещине на аэродроме.

Рис. 36. Прокладка автомобильной дороги от лагеря до аэродрома.

STUDY OF THE MORPHOLOGY OF THE ICE COVER BY SURVEYING

by

G. N. Yakovlev

Source:

Materialy nablyudeniy nauchno-issledovatel'skoy dreyfuyushcheye stantsii 1950/51 goda, ed. M. M. Somov, Leningrad, Izd. 'Morskoy Transport,' 1955. Vol. II, pp. 52-70; Appendices pp. 72-102.

At the drifting station the surveying work was done in connection with the general observations of the ice cover. The basic task of this work was study of the changes in the surface of the ice cover due to the melting of ice of different ages. Besides this basic task, the surveying work was designed to help solve a number of other problems, particularly the very important practical problem of the use of natural landing fields on year-old and old ice.

The following work was carried cut during the period of operations of the drifting station:

15-16 May	Two-kilometer surveying profile of the drifting ice field (Fig. 1, item No. 1).
16 June and 21 August	Survey of a sector of the old ice field (No. 2).
3 and 29 June, 7, 15 and 24 July, 7 and 17 August	Survey of a smoothed ice mound on the field of old ice (No. 3).
29 June, 7 July, 1 September	Survey of smoothed hummock ridges on the old ice (No. 4).
19 July, 3 September	Survey of test area No. 1, with drainage and snow cover (No. 5).
19 July, 3 September	Survey of test area No. 2, with drainage, but cleared of snow (No. 5).
19 July, 12 and 16 September	Survey of test area No. 3, without drainage, cleared of snow (No. 5).
19 July, 16 September	Survey of test area No. 4, natural conditions (No. 5).
19 July, 9 August	Survey of the test area on year-old ice, strewn with shavings (No. 6).
1 and 10 July	Survey of the area on the old ice (No. 7).
6 August	Survey along the axis of the airfield on year-old ice (No. 8).
6 August	Survey along a profile parallel to the axis of the airfield, on year-old natural ice cover (No. 9).
16-20 August	Survey of the test area on old ice before flooding (No. 10).
24 September	Survey along the axis of the area on the old ice after flooding (No. 10).

A short description of the work is given below (Fig. 1).

No. 1:* Survey of a profile with total length 2 km, made to characterize the relief of the drifting ice field. The profile passed through the old ice field (segment 1300 m long) and ended on the ice field that had formed in winter (segment 700 m long). The surveying points were made every 50 m. Boreholes to determine the ice thickness along the profile (length of 1.55 km) were made simultaneously with the survey. As a result we obtained a general profile of a segment of ice field characteristic of the drifting ice of this region. The conventional notations of profile points are given in Appendix I.

No. 2: Survey of a sector of the old ice field (area 30 x 30 m, survey points every 3 m). The work was carried out to determine the laws of formation of pools. The points were laid out on the area by attaching markers made of cloth to a rope; spacing 3 m. The survey was made by rows. The rope with the markers was stretched along the outermost row and readings were made for every point. Then the rope was moved to the next row (3 m away) and again the readings were taken at every point, etc. In all there were 11 rows with 11 points to the row on this area. The survey was made twice (16 June and 21 August), at the beginning and at the end of thawing. Fig. 2 shows a sketch-map of the condition of that area for 16 June. The results of the survey are given in Appendix II. Between surveys, visual observations were made of the development of the relief of the ice surface.

No. 3: A smoothed ice mound on old ice was surveyed periodically to study melting at the surface and on the variously exposed slopes (Appendix III). Surveys were made 7 times during the thaw season. The following plan was adopted: distances 0.5, 1, 2, 4, 6, 8, and 10 m from the top of the mound were taken in four opposite directions. The most distant points were at the base of the mound and on level places. The position of the points was determined by surveyor's rod and plumb line, and the data may differ slightly for successive readings.

No. 4: Survey of a smoothed hummock ridge to determine the changes in the relief on the level old ice field (Appendix IV). The profile was measured twice. On 7 July the profile was surveyed with a water level: the /regular/ level was used only to measure the height of the highest point of the hummock ridge. On September 1 a survey was made of the profile of the whole hummock ridge, 86 m long. The second set of points (repeats) were determined by surveyor's rod and plumb line.

Nos. 5-6: Survey of the test areas on the year-old ice (Appendices V-IX). In order to study the possibility of maintaining a level ice surface during the thaw period, test areas were prepared on which experiments were carried out to show the effect of various conditions on the development of the relief of the ice field during the thaw period. In all, five test areas were prepared:

---

*That is, "object" of "item" No. 1 on the survey map (Fig. 1) (D.K.).

1) an area (30 x 25 m) with a snow cover and with artificial drainage of meltwater under the ice (Fig. 3); rows and points taken every 3 m;

2) an area (30 x 25 m), cleared of snow, with artificial drainage of meltwater under the ice (Fig. 3); rows and points taken every 3 m;

3) an area (30 x 50 m), cleared of snow, without artificial drainage of meltwater under the ice (Fig. 4); rows and points taken every 3 m; the snow has been blown away by the wind and lies in random spots, not always distinguishable from the ice;

4) an area (30 x 50 m) with a snow cover, without artificial drainage of meltwater under the ice (Fig. 4); rows and points taken every 3 m; the snow has been blown away by the wind and lies in random spots, not always distinguishable from the ice;

5) a test area (11 x 12 m), covered with shavings to delay melting and destruction of the ice; the area is divided into 4 parts (Fig. 5) with shaving layers 1, 2, 3 and 4 cm thick; rows and points taken every 1 m.

The snow was cleared and the water drained from these areas systematically. The snow was cleared with primitive instruments (sheets of plywood, cut into two long sticks). To drain the water lying in the lowest places, boreholes were made in the ice and drainage ditches cut. Experimental results, in addition to the visual observations, were recorded by making two repeated surveys of all test areas. The first survey was made somewhat after the melting had begun. Therefore, the initial (average for the area) conventional notation for the surface was made in advance, it was 9850. The second survey was made at the end of thawing. The above-described method was applied for surveying. The points were taken every 3 m; in the case of the test areas with shavings this distance was reduced to 1 m. During the second survey of the last areas, part of the points were lost because of the deep layer of water on the ice, and in places because the ice had melted through. Since it was impossible to approach these points with surveyor's rod, the measurements were made selectively from an inflated rubber boat.

No. 7: Survey of the area west of the camp on old ice (Appendix X). The 550-m survey of this area was carried out twice, on 1 and 10 July. The second survey was made on part of the area after the ice surface had been leveled off artificially. The leveling work consisted in removing the snow from the mounds, filling in the pools, cutting down the mounds, and covering them with various dark materials (canvas, etc.) to speed up thawing. A sketch-map of the area is given in Fig. 6.

Nos. 8-9: Survey along the axis of the airfield on year-old ice and along the profile parallel to the axis of the airfield on natural ice cover (Appendices XI-XII). The survey was made on 6 August to obtain comparative data on the preservation of the surface relief during the period of icemelt after artificial measures had been undertaken to preserve the surface.

To keep the surface of the airfield level during the thaw period, the pools and the low parts of the relief were filled in periodically. Holes were bored in the pools and ditches were chopped along the airfield to promote drainage of water. Snow for fill-in work was brought from neighboring areas of the ice field. As a result of these measures, the level surface of the airfield was maintained to the end of the thaw period. This was determined by the survey along its axis (Fig. 7). For comparison, a simultaneous survey was made on the natural ice cover on this same field along a profile parallel to the axis of the airfield and 80 m from it. Points were taken every 5 m, length of each profile, 285 m. The ice thickness along the profiles was measured through the boreholes at the time the survey was made. The comparison of these profiles portrays graphically the great effectiveness of the described methods for maintaining the level surface of an ice cover.

No. 10: Survey of a test area on old ice before flooding (Appendix XIII) and after flooding (Appendix XIV). A sector 700 m long was surveyed twice. The results of the first survey (over the area with indications of the characteristic points) showed the initial state of the surface of the field of old ice that had been selected for the experiments. The second survey was carried out along the axis of this sector after the surface had been leveled out. For this purpose, boreholes were made in the elevated parts of the selected strip and all the depressions in the ice were flooded with water using a special pump. The highest ice mounds were blasted, chopped away, and the fragments carried off beyond the strip. A sketch-map of the area with the survey points is given in Fig. 8.

All surveying work was done with a dumpy level and surveying rods. Three bench marks were set in the ice. Bench marks 1 and 3 were fixed in the old ice: the first near thermometer area No. 1, the second in the vicinity of the hydrologists' tents. Bench mark 2 was set up in the vicinity of the airfield, on year-old ice, alongside the test areas. Square wooden stakes 1.5 m long, attached to wooden cross pieces with arms 25 cm long, served as the surveying rods. A hole 1.5 m deep was cut into the ice to hold the bench mark, then the hole was filled with pieces of ice and flooded. To keep bench marks 1 and 3 from melting out, they were covered with snow (Fig. 9), while shavings and empty sacks were spread around bench mark 2. Thanks to these measures, the benchmarks remained intact during the thaw period (Fig. 10).

The surveying work was done by G. N. Iakovlev and I. G. Petrov; during large scale operations they were aided by V. E. Blagodarov, A. I. Dmitriev, E. I. Iatsun and K. M. Kurko. M. M. Nikitin and Z. M. Gudkovich made the survey of map item No. 7; Nikitin took part in the survey of item No. 8, he also made the sketch of the test area.

The data was treated at the Cryological Laboratory of the Arctic Institute by Iu. L. Nazintsev, A. V. Stepanova and N. T. Veikina under the direction of G. N. Iakovlev. The results of the processing of the data are given in Appendices I-XIV.

The assembled data make it possible to trace the change in the relief of the old and year-old drifting ice cover.

In analogy to the character of processes inducing the development of a form of relief on the earth's surface as assumed in geomorphology, we can hold that the changes in the relief of the ice cover are also caused by different processes which may be divided into two groups, depending on the character of their influence on the ice cover.

To the first group belong the processes which form a particular kind of "macrorelief" and "mesorelief" of the ice cover: periodic, constant, and temporary currents, wind, and the ice drift connected with the wind. Due to these processes, which cause a regrouping of ice, hummocking takes place. The large-scale irregularities which occur (hummock ridges and pressure ridges) have strongly developed underwater sections. The formation of thick hummock ridges was often observed during the period of operations of the drifting station, primarily in young and year-old ice, and also at the junction of year-old and old ice fields (Fig. 11). With compression of ice of different ages, ridges of hummocks usually form from the younger and weaker ice, but with prolonged compression the time comes when even the stronger, older fields begin to break up and their fragments also form hummock ridges.

Pressure ridges are very significant in the formation of the macrorelief on the surface of the ice cover. In view of their size, the pressure ridges form the highest relief.

On 14 February 1951 we beheld a grandiose spectacle - the formation of pressure ridges on the old field. This was preceded by intense compression, as a result of which the old sealed cracks burst. After this the first pressure ridge arose at the eastern boundary of the field; it began to move quickly toward the center of the floe, grinding before it ice 3-4 m thick. After this a second ridge formed in front of the first, then a third, etc. The ridges moved, gradually grinding whole sectors of ice between them. Huge ice blocks were broken off the field easily, they rose up under the ridges and piled one on the other. A network of cracks appeared before the ridges. The ridges reached a height of 7 meters.

Because of this powerful hummocking, the relief of the comparatively level old floe changed abruptly in several hours (Fig. 12). In place of the level ice, a "mountain country" arose with rows of ridges, between which was ground and hummocked ice.

Besides the formation of relief with large irregularities, the "macrorelief" processes also cause formation of the smaller-scale "mesorelief." An example of this is the crack formation and hummocking of young ice on frozen leads as a result of compression. Submerged areas, thrusts, and small hummocks form in the cracks on the young ice. These phenomena are always encountered in selecting and constructing airfields on frozen leads. The processes of this type are most pronounced in winter.

The processes of the second group (the influence of solar radiation, warm air, meltwater, precipitation and plant and animal organisms on ice) cause the gradual destruction of the large forms of relief and thus cause the development of "mesorelief" and "microrelief" of ice. These processes affect the ice cover in the spring and, especially, in the winter.

Figure 13 shows the profile of a section of the old and the year-old ice field obtained by survey and by measuring ice thickness. The most dissected relief is to be noted at the crack between neighboring fields, where the maximum difference in height reaches 3.84 m. Here the relief was formed under the influence of processes of the first group which caused hummocking. The greatest difference in height on the hummocked section of the year-old field was 1.55 m. The relief of the upper and lower surfaces of the old ice is considerably more developed than that of the year-old ice, on which the influence of the processes of the second group have not yet developed to any considerable degree. The maximum differences in heights on the old field reached 1.44 m, according to the survey, while on the year-old field it was only 0.3 m.

The effect of the second-group processes on the development of the relief of the year-old ice field during the thaw period is apparent from Fig. 14, where two profiles are depicted, made on the year-old ice. The first profile (I) was taken along the axis of the airfield, where preventive measures had been taken to preserve an even surface, while the second (II) was taken on natural ice along a line parallel to the axis of the airfield and 80 m from the first profile.

Due to the protective measures, the even surface of the spring airfield was preserved; the maximum difference in heights of the profile was only 10 cm. On the second profile, however, toward the end of thawing, the relief was strongly developed and the differences in height reached 55 cm. The influence of the processes causing thawing was strongly expressed in the second profile on the relief of the lower surface of the ice cover, too, where the difference in height reached 110 cm, while it was only 20 cm on the first.

The change in relief on the sector of old ice connected with the development of pools was established by aerial surveys at the beginning and end of the thaw period and by systematic visual observations (Fig. 15). The first pools formed in places with the lowest relief. When the amount of meltwater increased, the area of the pools grew, were connected by streamlets, and the water horizon in the pools leveled out. The surface of the ice field became more uneven due to the formation of the pools and streamlets. After the water in the pools began to drain off under the ice, the ice field became noticeably drier and the underwater relief of the pools and streams became partially revealed. This can be seen from Fig. 15, which shows the water level in the pools on 25 June and 21 August. One can see, for example, that the stream in the upper part of Fig. 15 had dried up by 21 August and that only a deep depression was left in its place. In the same way, the pool shown in the left part of

the sketch, between rows V and IX on the survey, and which was at its maximum on 25 June, also dried up by 21 August, and in its place was a small ditch covered with snow 3-4 cm deep. A layer of water 3 cm deep was discovered in the ditch, under the snow, at a depth of 23 cm. The pool shown in the right lower part of the sketch had disappeared by 21 August.

Table 1 gives the change in water level on the test area during the thaw period. Characteristically, the area of the pools increased rapidly in the initial period of thaw because of meltwater and decreased somewhat after thaw holes had formed in the neighboring areas.

The microrelief develops especially intensely during thawing, on both the high places and on the bottom of the pools.

Table 1

Change of the water level at the test area

Date	Total area occupied by pools (%)
6/16/1950	6
6/21/1950	16
6/25/1950	36
8/21/1950	30

Using surveying, interesting observations were made of the melting of an ice mound on the old field. During the thaw period seven successive surveys of the mound were made in two mutually perpendicular directions (initial directions: N-S and E-W). The measurement results are given in Fig. 16. The amount of thawing on the summit of the mound from 3 June through 17 September was 65 cm. The most intense thawing was noted on the initial western and southern slopes of the mound (Table 2). Because of the varying intensity of thawing, the summit of the mound was displaced northward.

Table 2

Maximum thawing of ice on the mound

Initial place of observations	Magnitude of melting (cm)
summit of mound	65
southern slope of mound	82
western " " "	99
northern " " "	62
eastern " " "	69

Due to rotation, the floe on which the drifting station was located turned 38° clockwise during the period of observations.* Therefore, strictly speaking, the data given in Table 2 on the melting on the various slopes of the mound do not refer to the initial position of the profiles, but correspond to the changing orientation of the mound. However, the rotation of the floe was only 17° for the basic period of thaw, between June and July (Table 3).

The melting of the smoothed hummock ridges on the old ice (according to the surveying data) is given in Fig. 17, from which it is evident that the thawing of the ice in different sections of the profile was not uniform. The melting was more intensive on the southern slopes and summits of the mounds, the maximum was observed on the southern slopes (40 cm during the observation period).

Table 3

Maximum amplitudes of rotation of the floe by months

Months	Maximum rotation of the floe
June	7°
July	15
August	19
September (to the 17th)	2

*G. N. Îakovlev. "Nabliûdeniîa po gradientnoî ustanovke nad skorost'iu vetra i temperaturoî vozdukha" (Observations of the gradient device for /detecting/ wind velocity and air temperature), see this series, Vol. IV, Figure 6.

Special attention should be paid the results of applying measures to preserve the level surface of the ice fields during the thaw period. For this purpose meltwater was drained off under the ice, the ice surface was cleared of snow and the snow was used to fill the pools; further, the surface of the ice was strewn with layers of shavings of different thicknesses. Experiments showed that the most effective method was systematic drainage of meltwater from the ice surface through boreholes and drainage ditches. A good means of preventing further development of pools was to fill them in with snow.

In comparing test areas at the end of thawing it was found that the area maintaining the most even relief was the one with natural snow cover and with drainage of meltwater. Removal of snow from another section of the ice field did not yield positive results, since a white crust of ice formed on its surface, under which intensive thawing took place due to the "hothouse" effect. The even relief remained, but the ice under the crust was fragile, and highly disrupted by thawing. Snow protected the ice from melting better than the ice crust did.

Table 4

Area of pools on the test areas

Area No.	Type of area	Area of pools in percent
1.	drainage of water, snow cover	3
2.	drainage of water, snow cleared	15
3.	no drainage, snow cleared	34
4.	natural area	16

The results of the measures taken to preserve the relief of the ice are given in Table 4 where the area of the pools in September is given, after the second survey of the test areas. The pool with the greatest area formed on the test area without drainage and cleared of snow.

The experiments with shavings yielded very interesting data. We found that a layer of shavings 2 cm thick and more considerably retarded thawing and the areas with shavings began to rise above the surrounding ice even at the beginning of thawing (especially the area with a layer of shavings 4 cm thick). Under the shavings was a firm yellow-light bluish ice, without traces of destruction in the form of little upward-projecting columns, as on the natural sectors.

Besides these results of practical importance, there was also the negative side of the measures undertaken. First of all, it was found that the "boundary" effect is very important, it causes a rapid decrease in the size of the test areas. The wind blows away part of the shavings beyond the test area onto the natural ice, where intense thawing begins and pools appear. A lake of water, the bottom of which gradually becomes

deeper, forms around the area. The ice melts from the edges of the test areas and the shavings tumble into the water. Consequently, the size of the areas gradually decreases (Fig. 18).

Secondly, the thin layer of shavings (of the order of 1-4 cm) does not preserve an even surface during the thaw period. It was found that the ice covered with shavings melted unevenly, as a result of which the level surface of the ice gradually became moundy. The thinner the layer of shavings, the greater was the development of the surface relief of the ice (Fig. 19); the relief beneaththe 4-cm layer of shavings remained more or less even, the surface was most uneven under the 2-cm layer (maximum height of mounds, 30 cm).

Such irregular melting of ice was due both to the uneven quality of the shavings (in size and number of particles) and to the apparently insignificant differences in the thickness of a layer. These factors caused irregular melting in individual sectors and a mixing of the shavings with the meltwater. The shavings accumulated in depressions, the exposed ice thawed more quickly. This process went on continually.

The area with the 1-cm layer of shavings thawed quickly and was flooded with meltwater that could not be drained off since its level and the sea level were the same. The surface of this area which was under water, was completely smooth, in contrast to the others and did not show the slightest sign of mound formation. The layer of shavings on it, smoothed out by the water, lay ideally even.

In conclusion, let us note that special attention should be paid the aerial surveys (made with a level) with the artificial smoothing of the relief of the old field during the summer-fall period. The map of the section (Fig. 8) gives the general character of the old field at the end of the thaw period. The area occupied by pools had already diminished due to the drainage of water under the ice and amounted to 21% of the total area of the airfield. The surface relief was most highly developed, the maximum difference in height reached 140 cm, the depth of the pools 57 cm. The relief of the sector was evened out by flooding the lowest places with water, which eventually froze (the greatest difference in height along the axis of the experimental area was 7 cm).

Figures

Figure 14: Profiles of segments of the year-old ice.
I. profile along the axis of the airfield; II. profile parallel to the axis of the airfield on natural ice, 80 m away.

Figure 15: Sketch-map of the development of pools on the test area.
1. water area on 16 June; 2. water area on 21 June;
3. water area on 25 June; 4. water area on 21 August;
5. depth of water in pools
x-axis: points y-axis: rows

Figure 16: Melting of ice mound on the old field.
x-axes: distance y-axes: height

Figure 17: Melting along profile of smoothed hummock ridge.

Figure 18: Sketch-map of the test area with shavings, during the second survey.
1. surveying points; 2. depth in centimeters
x-axis: points y-axis: rows

Figure 19: Development of the relief of the ice surface covered with a layer of shavings 2 cm thick.

Appendix I (p. 72)

Survey of the profile of the drifting ice field

Column 1: Point number
2: Distance from beginning of survey line
3: Conventional notation
4: Snow depth in cm
5: Comments
Columns 6 through 10 repeat columns 1 through 5

15-16 May 1950

Russian words, column 1, in order of appearance:

Bench mark No. 3
Bench mark No. 3
Bench mark No. 1
Bench mark No. 2
Bench mark No. 1
Actinometric area
Stake No. 3

Russian words, column 6 (continues column 1), in order of appearance:

Stake No. 4
Stake No. 5
Point No. 20
Water line
Hummock
Hummock ridge
Hummock No. 2
Hummock ridge
Hummock
Water line in crack

Russian words, column 5, in order of appearance:

Bench mark No. 3 - beginning of survey line
A fresh crack runs 5 m to the west.
Crack on ice.
Survey in direction opposite bench mark No. 3.
At the meteorology area.
At the geophysicists' tent.
At the cryologists' tent.
At thermometer area No. 1
ditto

Appendix I (Cont'd.)

Russian words, column 10 (continues column 5), in order of appearance:

Between points Nos. 11 and 12.
Individual hummock on the ice field.
At the spring airfield.
Ditto.
No snow.
Region of hummocking.
Highest hummock beyond the field with the airstrip.
End of the profile.

Appendix II (pp. 73-75)

Survey of a sector of the field of old ice

Column 1: Row number
2: Point number
3: Conventional notation
4: Height in cm: Subdivisions: of snow on ice; of water on ice
5: Comments
Columns 6 through 10 repeat columns 1 through 5

16 June 1950

Russian words, column 2 and 7, in order of appearance:

Bench mark No. 1 (repeated throughout)

21 August 1950 (p. 74)

Russian words, column 2, in order of appearance:

Bench mark No. 1

Russian words, column 5, in order of appearance:

Point No. 8 on an ice cornice.
Water line in the pool.
Ice cornice above the water.
Water line in the pool.
Ditto.

Russian words, column 10 (continues column 2), in order of appearance:

Ice on the surface of the pool.
Water line in the pool, on the surface ice.
Ditto.
Water line in the pool, ice thickness 2.6 cm.
Water line in the pool.

Appendix II (Cont'd.)

Russian words, column 5, in order of appearance (p. 75):

Remains of a subterranean stream at a depth of 21 cm.
Water line in the pool.
Ditto.
Water line in the pool.

Russian words, column 10 (continues column 5) in order of appearance:

Point No. 5 in small hollow caused by dried up streamlet.

Appendix III (pp. 76-77)

Survey of an ice mound on the field of old ice

Column 1: Point number
2: Distance from beginning of survey line in m
3: Conventional notation
4: Depth of snow in cm
Columns 5 through 8 repeat columns 1 through 4

The Russian words in columns 1 and 5 are marked 1, 2, 3, with the following meanings:

1. Stake No. ___
2. At stake No. 3
3. Bench mark No. 1

Comment (bottom of p. 77); Stake No. 3 - the beginning of the survey line; points Nos. 1-6 were laid out to the north of stake No. 3, points 7-12 to the south, points 13-18, to the west, and points 19-24 to the east.

Appendix IV (pp. 78-79)

Survey of a smoothed hummock ridge on the old ice

Column 1: Point number
2: Distance from the beginning of the survey line in m
3: Conventional notation
4: Depth of snow in cm
5: Comment
Columns 6 through 10 repeat columns 1 through 5

29 June 1950

Russian words, column 5, in order of appearance:

Level place, beginning of the survey line.
Slope of mound.
Top of mound.
Bottom of hollow.
Transition to hollow.
Ditto
Slope of mound.
Summit of mound.
Slope of mound.
Slope of hollow.
Ditto
Bottom of hollow.
Hollow.
Slope of mound.
Highest point on ridge.
On slope of mound.
Ditto
Transition to hollow.
Ditto
Hollow.
Bottom of hollow.
Slope of hollow.
Slope of mound.
Hollow.

7 July 1950

Russian words, column 10, in order of appearance:

Highest point on ridge.

1 September 1950

Russian words, column 6, in order of appearance:

Pole in mound.
Stake No. 5.
(p.79)
Pole in mound.
Stake No. 5.
Bench mark No. 1.

Appendix V (pp. 80-81)

Survey of test area No. 1 (drainage and natural snow cover)

Column 1: Row number
2: Point number
3: Conventional notation
4: Comments
Columns 5 through 8 repeat columns 1 through 4

Appendix V (Cont'd.)

19 July 1950

Russian words, column 4, in order of appearance:

In the center of an ice hole at depth 12 cm.
20 cm to the north is a pool 1 m in diameter.

Column 8, same as column 4:

0.5 m to the north, a pool 0.5 m in diameter.

3 September 1950 (p. 81)

Russian words, columns 2 and 6, in order of appearance:

Bench mark No. 2.
Bench mark No. 2.

Appendix VI (pp. 82-83)

Survey of test area No. 2 (drainage, cleared of snow)

Column 1: Row number
2: Point number
3: Conventional notation
4: Depth of water in cm
5: Comments
Columns 6 through 10 repeat columns 1 through 5

Russian words, column 2, in order of appearance:

Bench mark No. 2.

Russian words columns 5 and 10, p. 82, in order of appearance:

Northern part of ice hole.
In the center of the pool.
In the center of the pool which is 1 m in diameter.
Northern part of the ice hole.
(column 10)
Center of the pool.
Southern part of the pool.
Southwestern part of pool 2 m in diameter.
Pool 2 x 7 m; western part.
The same, central part.
The same, eastern part.

Appendix V (Cont'd.)

19 July 1950

Russian words, column 4, in order of appearance:

In the center of an ice hole at depth 12 cm.
20 cm to the north is a pool 1 m in diameter.

Column 8, same as column 4:

0.5 m to the north, a pool 0.5 m in diameter.

3 September 1950 (p. 81)

Russian words, columns 2 and 6, in order of appearance: ⊙

Bench mark No. 2.
Bench mark No. 2.

Appendix VI (pp. 82-83)

Survey of test area No. 2 (drainage, cleared of snow)

Column 1: Row number
2: Point number
3: Conventional notation
4: Depth of water in cm
5: Comments
Columns 6 through 10 repeat columns 1 through 5

Russian words, column 2, in order of appearance:

Bench mark No. 2.

Russian words columns 5 and 10, p. 82, in order of appearance:

Northern part of ice hole.
In the center of the pool.
In the center of the pool which is 1 m in diameter.
Northern part of the ice hole.
(column 10)
Center of the pool.
Southern part of the pool.
Southwestern part of pool 2 m in diameter.
Pool 2 x 7 m; western part.
The same, central part.
The same, eastern part.

Appendix VI (Cont'd.)

Russian words, columns 2 and 7, p. 83, in order of appearance:

Bench mark No. 2
(column 7)
Bench mark No. 2
Water line in ice hole.

Russian words, columns 5 and 10, p. 82, in order of appearance:

Water line in pool.
Ditto
Rest of entries read: Water line in pool and ditto.

Appendix VII (pp. 84-87)

Survey of test area No. 3 (no drainage, cleared of snow)

Column 1: Row number
2: Point number
3: Conventional notation
4: Depth of water in cm
Columns 5 through 8 repeat columns 1 through 4

Russian words, column 2, in order of appearance:

Bench mark No. 2 (repeated throughout).

Footnote (bottom p. 85): An island 1 x 1 m.

Appendix VIII (pp. 88-91)

Survey of test area No. 4 (no drainage, natural snow cover)

Column 1: Row number
2: Point number
3: Conventional notation
4: Depth of water in cm
Columns 5 through 8 repeat columns 1 through 4

Russian words in columns 2 and 6, in order of appearance:

Bench mark No. 2 (p. 88).
Water line in ice hole (p. 89).
Bench mark No. 2.

Appendix IX (pp. 92-93)

Survey of the test area on year-old ice strewn with shavings

Column 1: Row number
2: Point number
3: Conventional notation
4: Depth of water in cm
5: Comment
Columns 6 through 10 repeat columns 1 through 5

Russian words in columns 2 and 7, in order of appearance:

Bench mark No. 2 (p. 92).
Bench mark No. 2 (p. 93).
Bench mark No. 2.
Water line in lake.

Russian words in column 9, p. 92, in order of appearance:

Ice hole.
Ice hole.

Russian words in columns 5 and 10 are numbered 1, 2, 3 etc. with the following meanings:

1. Ice.
2. The water emerges in a tongue from the area with shavings.
3. Ditto
4. Shavings in the water.
5. Shavings.
6. Water.
7. On the slope of the area, shavings in the water.
8. Ice hole.
9. Clear ice.
10. Points Nos. 1-11 on natural ice.
11. Points Nos. 12-23 on area with shavings.

Appendix X (pp. 94-95)

Survey of the area on the old ice

Column 1: Point number
2: Conventional notation
Columns 3 and 4 repeat columns 1 and 2

Russian words in columns 1 and 3, in order of appearance: p. 94:

Appendix X (Cont'd.)

Bench mark No. 3.
Picket No. 1.
Picket No. 2 etc., through Picket No. 27.
Water line in pool.
Bench mark No. 3.
Picket No. 4.
(p. 95)
Picket No. 2 etc., through Picket No. 7.
Water line in pool.

Appendix XI (p. 96)

Survey along the axis of the airfield on the year-old ice

Column 1: Point number
2: Distance from the beginning of the survey line in m
3: Conventional notation
4: Thickness of layer of ice that could be penetrated with a stake
5: Comments
Columns 6 through 10 repeat columns 1 through 5

Russian words in column 1, in order of appearance:

Water line in the crack.

Russian words in columns 5 and 10, in order of appearance:

Beginning of the airfield.
To the left of the axis, continuous pools at the boundary of the airfield.
1 m to the left, a pool 20 x 20 m, filled in with snow.
To the right, a pool 10 x 15 m, filled in with snow.
Stop No. 2.
To the right, a pool 10 x 40 m.
A pool filled in with snow.
To the right, a pool 20 x 30 m.
A pool, water layer 10 cm.
Stop No. 3.
Pool 2 m in diameter, filled in with snow, water 7 cm.

Appendix XII (p. 98)

Survey along the profile parallel to the axis of the airfield on year-old ice

Column 1: Point number
2: Distance from the beginning of the survey line in m
3: Conventional notation

Appendix XII (Cont'd.)

Column 4: Thickness of layer of ice that could be penetrated with a stake
5: Comment
Columns 6 through 10 repeat columns 1 through 5

Russian words in order of appearance, column 1:

Water line in crack.

Russian words in columns 5 and 10, in order of appearance:

Stop No. 3.
Pool 5 x 8 m.
To the right, a pool.
Pool 5 x 6 m.
Stop No. 2.
Stop No. 1.

Appendix XIII (pp. 98-101)

Survey of the test area on old ice before flooding

Column 1: Point number
2: Distance from beginning of survey line in m
3: Conventional notation
4: Comment
Columns 5 through 8 repeat columns 1 through 4

Russian words in columns 1 and 6 are numbered 1, 2, etc., with the following meanings:

1. Picket No. ___
2. Point No. ___
3. Water line.
4. Bench mark No. ___

Russian words in columns 5 and 10 are lettered A, B, etc., with the following meanings:

A. Beginning of survey.
B. Stop No. ___
C. Water line in pool.
D. Reading after interruption
E. 230 mm according to the upper hair [meaning obscure, could also be 230 mm along upper hair (or filament), but probably refers to the cross hair of the instrument, D.K.].
F. Water line in the crack.

Appendix XIV (p. 102)

Survey along the axis of the test area on old ice after flooding

Column 1: Point number
2: Distance from beginning of survey line in m
3: Conventional notation
Columns 4 through 6 repeat columns 1 through 3

Russian words in columns 1 and 3 are numbered 1, 2, 3, with the meanings:

1. Picket No. ___
2. Bench mark No. ___
3. Sea level.

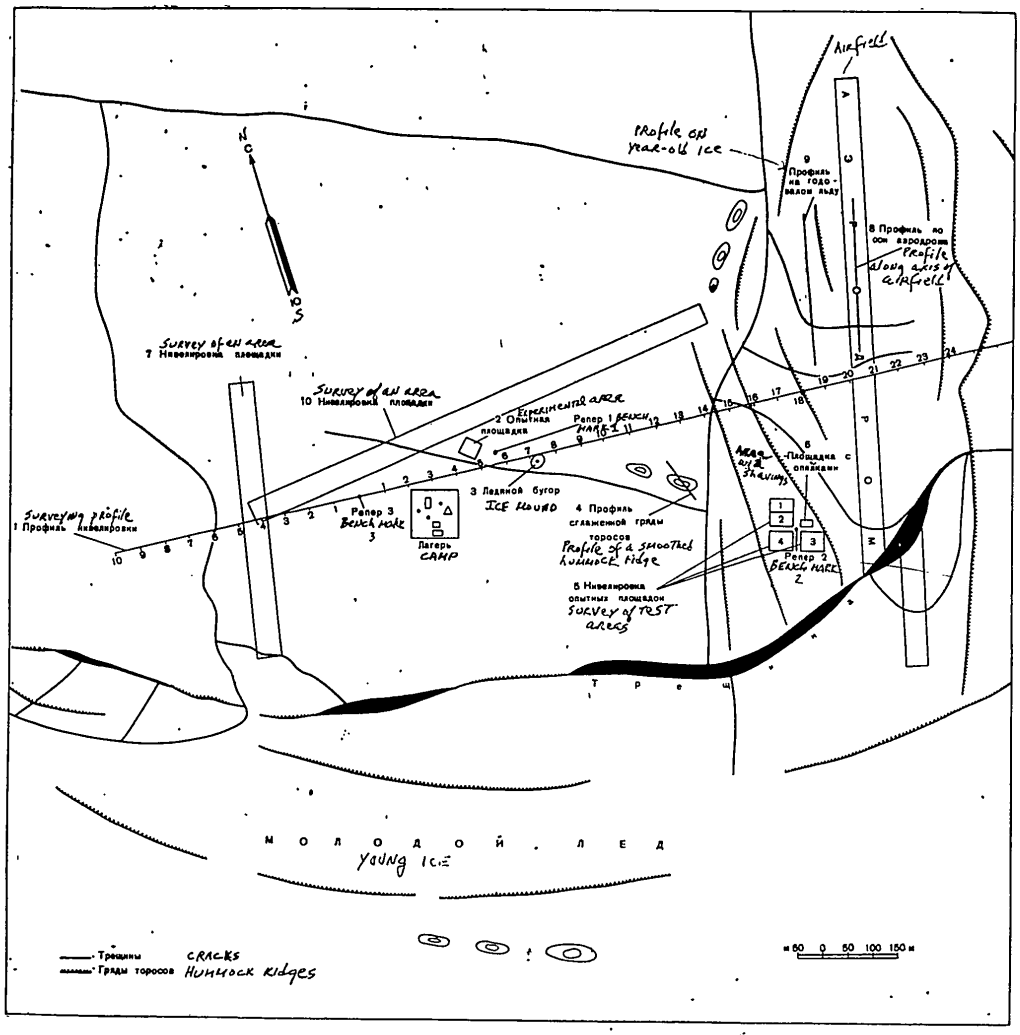


Рис. 1 Схема расположения объектов нивелировки на дрейфующем льду.

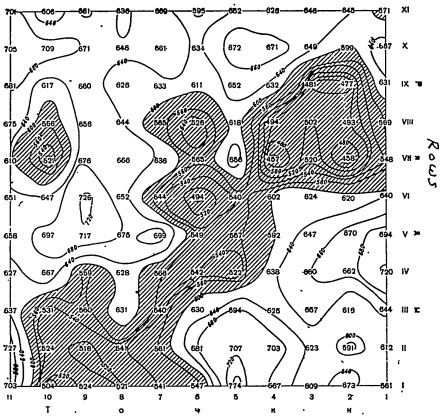


Рис. 2. Схема площадки на многолетнем поле по данным нивелировки 16 июня. Штриховкой показаны наиболее пониженные участки, ограниченные изолинией *600*.

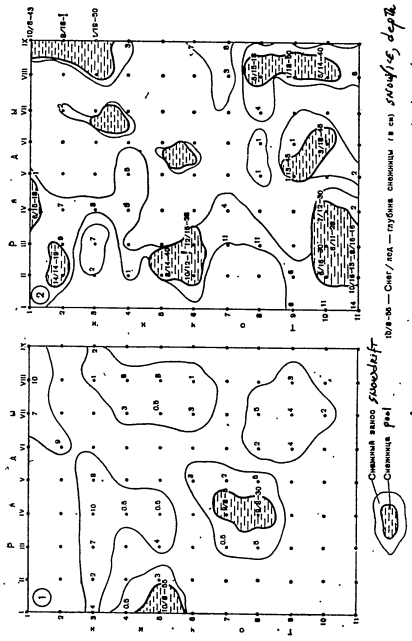


Рис. 3. Схема опытных площадок со спуском воды.
1 — площадки № 1 со снежным покровом; *2* — площадка № 2, очищенная от снега. Цифры у точек обозначают толщину снега на льду (в сантиметрах).

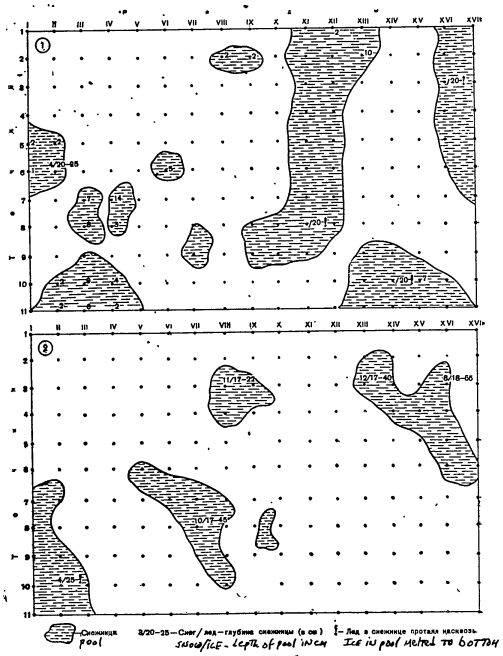


Рис. 4. Схема опытных площадок без спуска воды.
1 — площадка № 3, очищенная от снега; *2* — площадка № 4 со снежным покровом.

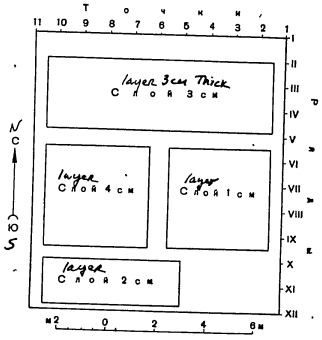


Рис. 5. План опытной площадки, покрытой опилками.

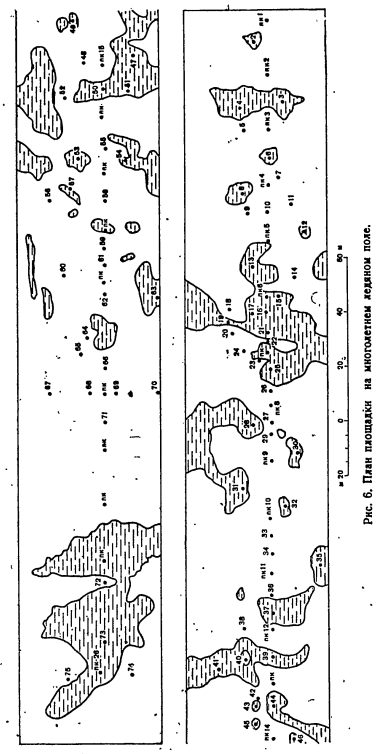


Рис. 6. План площадки на многометровом ледяном поле.

Рис. 7. Поверхность весеннего аэродрома к концу периода таяния.

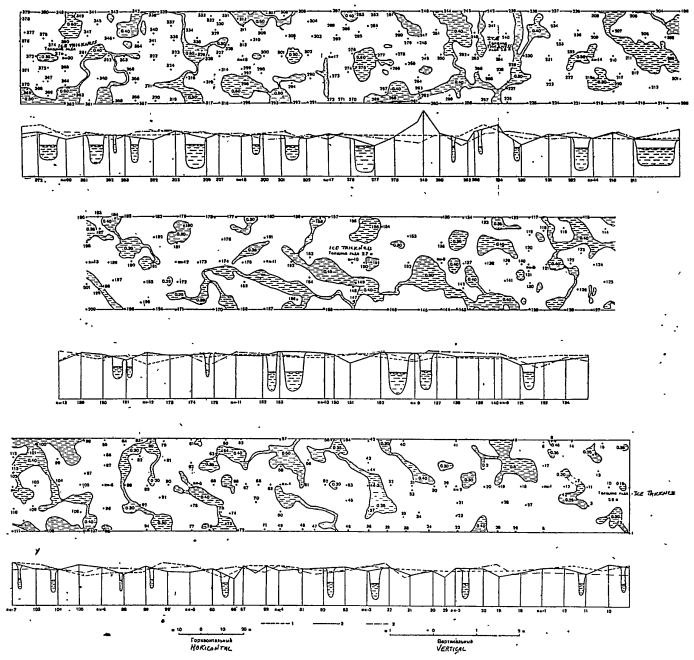


Рис. 8. План площадки на многолетнем льде до заливки водой. Высоты показаны от условного нуля
1 — профиль по краю площадки (справа от оси) по лучу максимума; *2* — профиль по оси площадки; *3* — профиль по краю площадки (слева от оси) по лучу максимума.

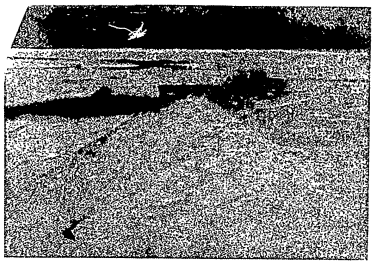


Рис. 9. Репер № 1, обсыпанный снегом для предохранения от вытаивания

Рис. 10. Состояние репера № 2 к концу периода таяния

Рис. 11. Торосы по трещине между полями.

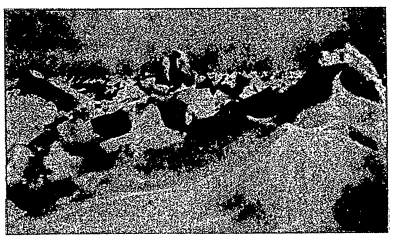


Рис. 12. Всторошенное ледяное поле.

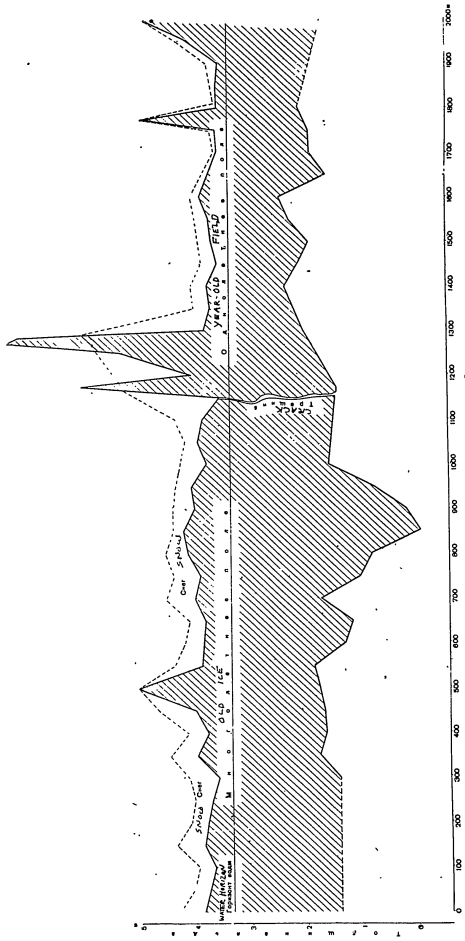


Рис. 13. Профиль участка ледяного поля

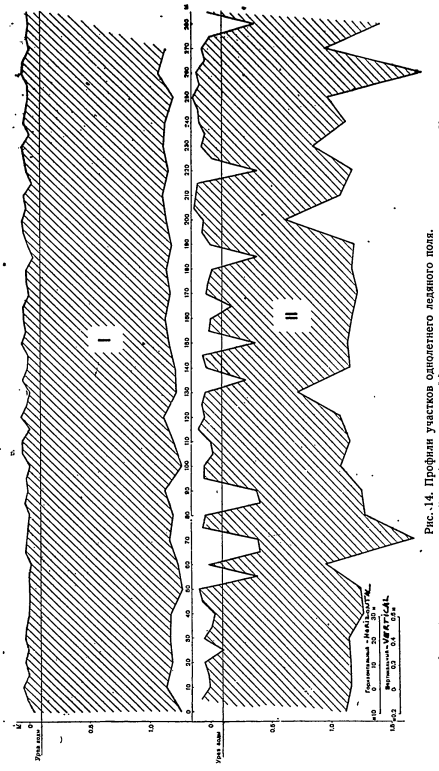


Рис. 14. Профили участков одноletнего ледяного поля.
I — профиль по оси аэродрома; II — профиль, параллельный оси аэродрома на естественном льду, на расстоянии 80 м.

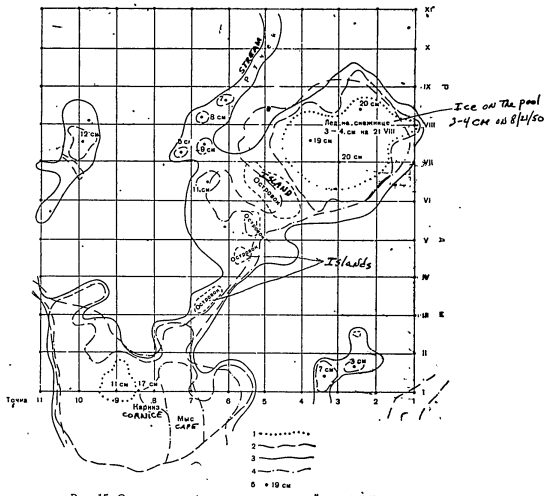
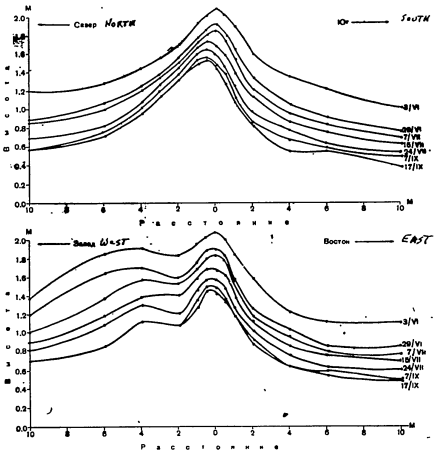


Рис. 15. Схема развития снежниц на опытной площадке.
1 — площадь воды на 16 июня; 2 — площадь воды на 21 июня; 3 — площадь воды на 26 июня; 4 — площадь воды на 21 августа; 5 — глубина воды в снежницах.



период наблюдений).

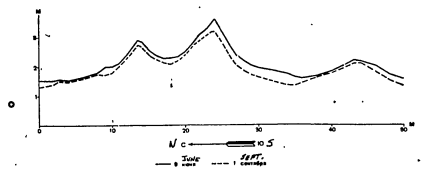


Рис. 17. Стаивание по профилю сглаженной гряды торосов.

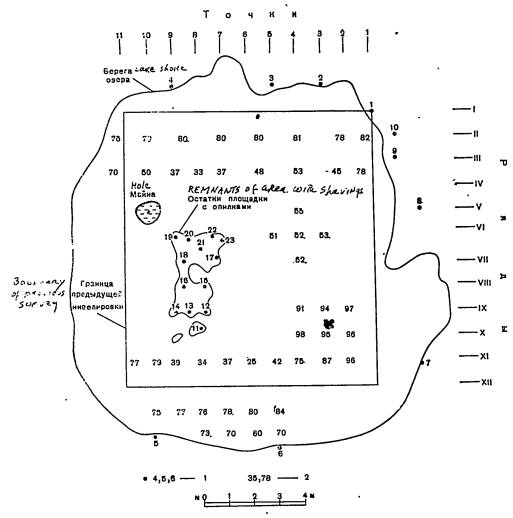


Рис. 18. План опытной площадки с опилками во время повторной нивелировки.
1 — точки нивелировки; *2* — глубина в сантиметрах.

Рис. 10. Развитие рельефа поверхности льда, покрытой слоем опилок 2 см

Приложение 1

Нивелировка профиля дрейфующего ледяного поля

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)	Примечание	№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)	Примечание
		15—16 мая 1950 г.							
Репер № 3	0	10 000	0	Репер № 3— начало хода	Рейка № 4	—	9 173	23	
					19	450	9 013	31	
1	50	8 975	65		Рейка № 5	—	8 876	41	
2	100	8 754	36		Точка № 20	500	8 749	—	
3	150	8 947	48		Урез воды	—	8 319	22	Между точками № 11 и 12
4	200	8 577	52						
5	250	8 698	30	В 5 м к западу проходит свежая трещина	21	550	8 897	22	
					22	600	8 816	48	
					23	650	8 509	—	
6	300	8 766	30	Трещина на льду	Торос	—	10 998	—	Отдельный торос на ледяном поле
7	350	8 837	50						
8	400	8 627	28		24	700	9 011	40	
9	450	8 750	29		25	750	10 261	—	
10	500	8 848	44		Гряда торосов	—	11 322	0	
Репер № 3	0	10 000	0	Нивелировка в противоположную сторону от репера № 3	Торос № 2	—	11 122	0	
					26	800	8 773	42	
					27	850	8 664	28	
					28	900	8 711	26	
11	50	8 849	50		29	950	8 326	26	
12	100	8 813	34		30	1 000	8 632	23	На весеннем аэродроме то же
13	150	8 781	28	На метеорологической площадке	31	1 050	8 663	23	
					32	1 100	8 819	19	
14	200	8 959	52	У палатки геофизиков	33	1 200	8 640	—	
					34	1 250	8 519	6	
15	250	8 862	47		35	1 300	8 544	13	
16	300	9 080	39		Гряда торосов	—	9 880	—	Снега нет
Репер № 1	—	9 511	0	У палатки ледоисследователей	36	1 350	8 495	8	
					37	1 400	8 524	13	
17	350	9 156	19		38	1 450	8 489	26	Район торошения
Рейка № 2	—	8 982	—	На термометрической площадке № 1 то же	39	1 500	9 033	20	
					Торос	—	9 940	0	За полем аэродрома самый высокий торос
Рейка № 1	—	8 978	—						
Актинометрическая площадка	—	8 602	—		Урез воды в трещине	—	8 315	—	Конец профиля
Рейка № 3	—	10 263	—						
18	400	8 961	39						

Приложение II

Нивелировка участка многолетнего ледяного поля

№ ряда	№ точки	Условная отметка	Высота (см) снега на льду	Высота (см) воды на льду	Примечание
		16 июня 1950 г.			
	Репер № 1	9 511	—	—	
1	1	8 561	23	—	
	2	8 673	8	—	
	3	8 609	13	1	
	4	8 667	7	—	
	5	8 774	4	—	
	6	8 547	17	8	
	7	8 541	18	9	
	8	8 521	—	12	
	9	8 524	—	11	
	10	8 504	13	3	
	11	8 703	7	—	
2	11	8 727	13	—	
	10	8 524	10	10	
	9	8 516	14	10	
	8	8 541	17	8	
	7	8 561	4	6	
	6	8 681	3	—	
	5	8 707	6	—	
	4	8 703	11	—	
	8	8 623	17	—	
	2	8 591	15	1	
	1	8 612	14	14	
	Репер № 1	9 511	—	—	
3	1	8 644	17	—	
	2	8 616	16	—	
	3	8 657	16	—	
	4	8 625	17	—	
	5	8 694	7	—	
	6	8 630	11	8	
	7	8 540	18	—	
	8	8 631	21	11	
	9	8 560	25	9	
	10	8 531	—	—	
	11	8 637	3	—	
4	11	8 627	7	—	
	10	8 667	4	16	
	9	8 559	23	—	
	8	8 628	24	—	
	7	8 566	23	5	
	6	8 542	26	8	
	5	8 522	17	—	
	4	8 638	15	—	
	3	8 660	21	—	
	2	8 662	13	—	
	1	8 720	9	—	
	Репер № 1	9 511	—	—	
5	1	8 694	11	—	
	2	8 670	6	—	
	3	8 647	8	—	
	4	8 592	17	4	
	5	8 557	27	9	
	6	8 549	23	4	
	7	8 699	16	—	
5	8	8 675	15	—	
	9	8 717	5	—	
	10	8 697	6	—	
	11	8 658	10	—	
6	11	8 651	9	—	
	10	8 647	12	—	
	9	8 729	9	—	
	8	8 652	15	—	
	7	8 544	20	8	
	6	8 494	19	13	
	5	8 540	15	8	
	4	8 602	12	3	
	3	8 624	3	3	
	2	8 620	3	—	
	1	8 640	7	—	
	Репер № 1	9 511	—	—	
7	1	8 548	—	12	
	2	8 458	29	16	
	3	8 520	16	17	
	4	8 457	17	15	
	5	8 656	10	—	
	6	8 565	15	7	
	7	8 63	15	3	
	8	8 66[illegible]	6	—	
	9	8 676	7	—	
	10	8 521	22	10	
	11	8 610	16	1	
8	11	8 675	6	—	
	10	8 566	18	6	
	9	8 65[illegible]	8	—	
	8	8 644	11	—	
	7	8 565	12	6	
	6	8 535	19	9	
	5	8 618	12	5	
	4	8 494	13	13	
	3	8 502	17	12	
	2	8 493	21	12	
	1	8 569	14	12	
	Репер № 1	9 511	—	—	
9	1	8 631	9	—	
	2	8 477	25	12	
	3	8 431	17	14	
	4	8 632	14	—	
	5	8 652	10	—	
	6	8 611	9	1	
	7	8 633	7	—	
	8	8 626	12	—	
	9	8 660	13	—	
	10	8 617	14	—	
	11	8 681	8	—	
10	11	8 705	7	—	
	10	8 709	14	—	

Продолж. приложения II

№ ряда	№ точки	Условная отметка	Высота (см) снега на льду	Высота (см) воды на льду	Примечание
10	9	8 671	6	—	
	8	8 646	7	—	
	7	8 661	14	—	
	6	8 634	13	—	
	5	8 672	16	—	
	4	8 671	10	—	
	3	8 649	12	—	
	2	8 599	6	—	
	1	8 167	9	—	
	Репер № 1	9 511	—	—	
11	1	8 571	25	—	
	2	8 645	20	—	
	3	8 646	19	—	
	4	8 626	14	—	
	5	8 652	14	—	
	6	8 595	9	—	
	7	8 669	6	—	
	8	8 636	8	—	
	9	8 681	2	—	
	10	8 606	3	—	
	11	8 701	9	—	

21 августа 1950 г.

№ ряда	№ точки	Условная отметка	Высота (см) снега на льду	Высота (см) воды на льду	Примечание
	Репер № 1	9 511	—	—	
1	1	8 242	—	—	
	2	8 424	—	—	
	3	8 405	—	—	
	4	8 326	—	—	
	5	8 395	—	—	
	6	8 143	—	—	
	7	8 15н	—	—	
	8	8 131	—	—	Точка № 8 на ледяном карнизе
	9	8 096	30	—	Урез воды в снежнице
	10	8 147	—	—	Над водой ледяной карниз
	11	8 372	—	—	
2	1	8 383	—	—	
	2	8 382	—	—	
	3	8 350	—	—	
	4	8 387	—	—	
	5	8 416	—	—	
	6	8 398	—	—	
	7	8 255	—	—	
	8	8 170	—	—	
	9	8 097	26	—	Урез воды в снежнице
	10	8 097	24	—	то же
	11	8 438	—	—	
3	1	8 504	—	—	
	2	8 430	—	—	
	3	8 403	—	—	
3	4	8 455	—	—	
	5	8 468	—	—	
	6	8 391	—	—	
	7	8 282	—	—	
	8	8 363	—	—	
	9	8 290	—	—	
	10	8 098	—	—	
	11	8 387	—	—	
4	11	8 358	—	—	
	10	8 391	—	—	
	9	8 302	—	—	
	8	8 440	—	—	
	7	8 406	—	—	
	6	8 323	—	—	
	5	8 424	—	—	
	4	8 458	—	—	
	3	8 520	—	—	
	2	8 493	—	—	
	1	8 473	—	—	
5	1	2 522	—	—	
	2	8 494	—	—	
	3	8 428	—	—	
	4	8 390	—	—	
	5	8 275	—	—	
	6	8 371	—	—	
	7	8 488	—	—	
	8	8 464	—	—	
	9	8 466	—	—	
	10	8 445	—	—	
	11	8 388	—	—	
6	11	8 370	—	—	
	10	8 430	—	—	
	9	8 463	—	—	
	8	8 445	—	—	
	7	8 374	—	—	
	6	8 123	26	—	Лед на поверхности снежницы
	5	8 332	—	—	
	4	8 104	36	—	Урез воды в снежнице на (поверхности льд)
	3	—	30	—	то же
	2	8 350	—	—	
	1	8 495	—	—	
7	1	8 389	—	—	
	2	8 095	36	—	Урез воды в снежнице, толщина льда 2.6 см
	3	8 095	36	—	
	4	8 095	37	—	Урез воды в снежнице
	5	8 095	30	—	

Продолж. приложения II

№ ряда	№ точки	Условная отметка	Высота (см) снега на льду	Высота (см) воды на льду	Примечание
7	6	8 244	5	—	Остатки подземного ручья на глубине 21 см
	7	8 360	—	—	
	8	8 418	—	—	
	9	8 425	—	—	
	10	8 315	—	—	
	11	8 398	—	—	
8	11	8 420	—	—	
	10	8 378	—	—	
	9	8 384	—	—	
	8	8 402	—	—	
	7	8 355	—	—	
	6	8 311	—	—	
	5	8 095	32	—	Урез воды в снежнице то же
	4	8 095	38	—	
	3	8 095	35	—	
	2	8 095	34	—	
	1	8 408	—	—	
9	1	8 430	—	—	
	2	8 373	—	—	
	3	8 095	32	—	Урез воды в снежнице
	4	8 448	—	—	
	5	8 471	—	—	
	6	8 400	—	—	
	7	8 424	—	—	
9	8	8 415	—	—	
	9	8 433	—	—	
	10	8 408	—	—	
	11	8 436	—	—	
10	11	8 458	—	—	
	10	8 444	—	—	
	9	8 444	—	—	
	8	8 396	—	—	
	7	8 464	—	—	
	6	8 473	—	—	
	5	8 410	—	—	Точка 5 в небольшой ложбине от пересохшего ручья
	4	8 511	—	—	
	3	8 596	—	—	
	2	8 483	—	—	
	1	8 494	—	—	
11	1	8 458	—	—	
	2	8 508	—	—	
	3	8 520	—	—	
	4	8 432	—	—	
	5	8 410	—	—	
	6	8 468	—	—	
	7	8 424	—	—	
	8	8 381	—	—	
	9	8 332	—	—	
	10	8 450	—	—	
	11	8 424	—	—	

Приложение III

Нивелировка ледяного бугра на многолетнем поле

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)
3 июня 1950 г.			
1 Рейка № 3	0	10 263	—
2 У рейки № 3	0	10 077	1
1	0.5	9 996	1
2	1.0	9 927	6
3	2.0	9 690	7
4	4.0	9 453	19
5	6.0	9 281	22
6	10.0	9 200	31
7	0.5	10 001	4
8	1.0	9 880	22
9	2.0	9 581	39
10	4.0	9 369	42
11	6.0	9 217	35
12	10.0	9 000	24
13	0.5	10 025	1
14	1.0	9 944	8
15	2.0	9 825	21
16	4.0	9 898	7
17	6.0	9 854	7
18	10.0	9 377	18
19	0.5	9 992	1
20	1.0	9 831	11
21	2.0	9 579	29
22	4.0	9 213	15
23	6.0	9 120	5
24	10.0	9 125	30
29 июня 1950 г.			
1 Рейка № 3	0	10 263	—
2 У рейки № 3	0	9 898	6
1	0.5	9 852	6
2	1.0	9 767	6
3	2.0	9 542	8
4	4.0	9 258	11
5	6.0	9 054	11
6	10.0	8 888	10
7	0.5	9 783	6
8	1.0	9 618	6
9	2.0	9 325	10
10	4.0	9 039	12
11	6.0	8 922	10
12	10.0	8 756	11
13	0.5	9 888	5
14	1.0	9 749	7
15	2.0	9 585	10
16	4.0	9 700	11
17	6.0	9 646	8
18	10.0	9 203	12
19	0.5	9 846	6
20	1.0	9 576	5
21	2.0	9 272	12
22	4.0	9 030	11
23	6.0	8 858	8
24	10.0	8 863	12
7 июля 1950 г.			
1	0.5	9 788	8
2	1.0	9 722	6
3	2.0	9 510	3
4	4.0	9 215	5
5	6.0	8 987	5
6	10.0	8 835	4
7	0.5	9 722	3
8	1.0	9 530	4
9	2.0	9 198	10
10	4.0	8 944	10
11	6.0	8 827	8
12	10.0	8 672	7
13	0.5	9 798	2
14	1.0	9 692	1
15	2.0	9 533	2
16	4.0	9 585	2
17	6.0	9 373	2
18	10.0	9 006	—
19	0.5	9 774	5
20	1.0	9 546	5
21	2.0	9 195	10
22	4.0	8 965	8
23	6.0	8 899	8
24	10.0	8 777	7
2 У рейки № 3	0	9 833	8
15 июля 1950 г.			
1 Рейка № 3	0	10 263	—
2 У рейки № 3	0	9 671	—
1	0.5	9 721	—
2	1.0	9 653	—
3	2.0	9 430	—
4	4.0	9 097	—
5	6.0	8 874	—
6	10.0	8 681	—
7	0.5	9 577	—
8	1.0	9 374	—
9	2.0	9 107	—
10	4.0	8 852	—
11	6.0	8 762	—
12	10.0	8 615	—
13	0.5	9 679	—
14	1.0	9 583	—
15	2.0	9 404	—
16	4.0	9 386	—
17	6.0	9 182	—
18	10.0	8 901	—
19	0.5	9 635	—
20	1.0	9 383	—
21	2.0	9 127	—
22	4.0	8 863	—
23	6.0	8 769	—
24	10.0	8 703	—

Продолж. приложения III

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)
24 июля 1950 г.			
1 Рейка № 3	0	10 263	—
2 У рейки № 3	0	9 583	—
1	0.5	9 625	—
2	1.0	9 584	—
3	2.0	9 355	—
4	4.0	9 021	—
5	6.0	8 751	—
6	10.0	8 605	—
7	0.5	9 445	—
8	1.0	9 244	—
9	3.0	8 971	—
10	4.0	8 783	—
11	6.0	8 635	—
12	10.0	8 529	—
13	0.5	9 571	—
14	1.0	9 459	—
15	2.0	9 205	—
16	4.0	9 311	—
17	6.0	9 086	—
18	10.0	8 809	—
19	0.5	9 477	—
20	1.0	9 279	—
21	2.0	9 014	—
22	4.0	8 739	—
23	6.0	8 625	—
24	10.0	8 607	—
1 Рейка № 3	0	10 265	—
7 августа 1950 г.			
3 Репер № 1	—	9 413	—
1 Рейка № 3	0	10 263	—
2 У рейки № 3	0	9 481	—
1	0.5	9 551	—
2	1.0	9 520	—
3	2.0	9 300	—
4	4.0	8 972	—
5	6.0	8 706	—
6	10.0	8 548	—
7	0.5	9 274	—
8	1.0	9 111	—
9	2.0	8 852	—
10	4.0	8 676	—
11	6.0	8 579	—
12	10.0	8 496	—
13	0.5	9 486	—
14	1.0	9 344	—
15	2.0	9 076	—
16	4.0	9 122	—
17	6.0	8 853	—
18	10.0	8 696	—
19	0.5	9 350	—
20	1.0	9 173	—
21	2.0	8 919	—
22	4.0	8 655	—
23	6.0	8 605	—
24	10.0	8 483	—
1 Рейка № 4	—	9 241	—
17 августа 1950 г.			
3 Репер № 1	—	9 511	—
1 Рейка № 1	—	9 223	—
№ 2	—	9 158	—
№ 11	—	9 117	—
№ 4	—	9 319	—
2 № 3	0	10 263	—
У рейки № 3	0	9 429	—
1	0.5	9 522	—
2	1.0	9 489	—
3	2.0	9 311	—
4	4.0	8 973	—
5	6.0	8 695	—
6	10.0	8 652	—
7	0.5	9 261	—
8	1.0	9 057	—
9	2.0	8 820	—
10	4.0	8 551	—
11	6.0	8 564	—
12	10.0	8 377	—
13	0.5	9 457	—
14	1.0	9 279	—
15	2.0	9 097	—
16	4.0	9 143	—
17	6.0	8 962	—
18	10.0	8 712	—
19	0.5	9 349	—
20	1.0	9 197	—
21	2 0	8 893	—
22	4.0	8 654	—
23	6.0	8 543	—
24	10.0	8 577	—

Примечание. Рейка № 3 — начало хода; точки № 1—6 располагаются на север, точки № 7—12 на юг, точки № 13—18 на запад и точки № 19—24 на восток от рейки № 3.

Приложение IV

Нивелировка сглаженной гряды торосов на многолетнем льду

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)	Примечание
		29 июня 1950 г.		
1	0	8 541	01	Ровное место, начало хода
2	2.0	8 541	6	Склон бугра
3	2.7	8 581	9	Верх бугра
4	4.0	8 521	10	Низ лощины
5	6.0	8 651	14	Переход в лощину
6	8.0	8 801	9	то же
7	9.0	8 001	14	"
8	10.0	9 011	11	Склон бугра
9	11.0	9 131	10	" "
10	12.0	9 431	9	" "
11	13.4	9 921	6	Вершина бугра
12	14.0	9 871	5	Склон бугра
13	15 0	9 561	8	" "
14	16.0	9 421	4	Склон лощины
15	17.0	9 331	9	то же
16	18.0	9 321	15	Низ лощины
17	19.0	9 371	12	Лощина
18	20.0	9 531	15	Склон бугра
19	21.0	9 821	15	" "
20	22.0	10 151	11	" "
21	22.5	10 231	8	" "
22	23.0	10 321	14	" "
23	23.5	10 481	6	" "
24	24.0	10 651	6	Самая высокая точка гряды
25	24.5	10 451	18	На склоне бугра
26	25.0	10 221	29	то же
27	25.5	10 001	21	"
28	26.0	9 791	22	"
29	27.0	9 401	21	"
30	28.0	9 211	26	"
31	29.0	9 061	29	Переход в лощину
32	30.0	8 981	20	то же
33	32.0	8 901	16	"
34	34.0	8 791	20	"
35	35.0	8 671	19	Лощина
36	36.0	8 621	27	Низ лощины
37	38.0	8 691	20	Склон лощины
38	40.0	8 861	10	Склон бугра
39	42.0	9 081	12	Бугор
40	44.0	9 221	7	"
41	44.0	9 171	10	Склон бугра
42	46.0	9 011	12	" "
43	48.0	8 731	13	" "
44	50.0	8 561	27	Лощина

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)	Примечание
		7 июля 1950 г.		
24	24,0	10 651	6	Самая высокая точка гряды
		1 сентября 1950 г.		
1	0	8 319	12	
2	2.0	8 436	—	
3	2.7	8 524	—	
4	4.0	8 501	—	
5	6.0	8 687		
6	8.0	8 767	—	
7	9.0	8 741	—	
8	10.0	8 829	—	
9	11.0	9 059	—	
10	12.0	9 329	—	
11	13.4	9 745	—	
12	14.0	9 693	—	
13	15.0	9 439	4	
14	16.0	9 287	3	
15	17.0	9 180	—	
16	18.0	9 111	2	
17	19.0	9 241	—	
18	20.0	9 441	—	
19	21.0	9 713	—	
20	22.0	9 959	—	
21	22.5	10 045	—	
22	23.0	10 116	—	
23	23.5	10 211	—	
24	24.0	10 243	—	
Кол на бугре		10 419	—	
Рейка № 5	—	8 948	—	
№ 4	—	8 971	—	
№ 3	—	10 366	—	
№ 1	—	9 511	—	
25	24.5	1 011	—	
26	25.0	9 853	—	
27	25.5	9 619	—	
28	26.0	9 417	—	
29	27.0	9 071	—	
30	28.0	8 867	2	
31	29.0	8 741	4	
32	30.0	8 661	2	
33	32.0	8 505	—	
34	34.0	8 381	6	
35	35.0	8 383	—	
36	36.0	8 461	—	
37	38.0	8 659	—	
38	40.0	8 781	—	
39	42.0	8 965	—	
40	43.0	9 091	—	
41	44.0	9 105	—	
42	46.0	8 829	—	

Продолж. приложения IV

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)	Примечание
43	48.0	8 521	—	
44	50.0	8 346	—	
45	54.0	8 491	—	
46	58.0	8 651	—	
47	62.0	8 241	—	
48	66	8 273	—	
49	70	8 336	—	
50	74	8 335	—	
51	78	8 375	—	
52	82	8 347	—	

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота снега (см)	Примечание
53	86	8 253	—	
54	90	8 191	—	
55	94	8 560	—	
56	98	8 707	—	
57	102	8 413	—	
Кол на бугре		10 421	—	
Рейка № 5	—	8 949	—	
№ 4	—	9 319	—	
№ 3	—	10 365	—	
Репер № 1	—	9 517	—	

Приложение V

Нивелировка опытной площадки № 1
(со спуском воды и естественным снежным покровом)

№ ряда	№ точки	Условная отметка	Примечание	№ ряда	№ точки	Условная отметка	Примечание
		July 19 июля 1950 г.					
1	1	9 360		5	6	9 374	
	2	9 350			7	9 366	
	3	9 366			8	9 380	
	4	9 329			9	9 429	
	5	9 314			10	9 404	
	6	9 160	В центре майны на глубине 12 *см*	6	11	9 424	
					11	9 420	
	7	9 384			10	9 414	
	8	9 388			9	9 408	
	9	9 406			8	9 428	
	10	9 404			7	9 372	В 0.5 *м* к северу снежница диаметром 0.5 *м*
	11	9 320					
2	11	9 329					
	10	9 414			6	9 350	
	9	9 464			5	9 404	
	8	9 370			4	9 360	
	7	9 408			3	9 374	
	6	9 346			2	9 340	
	5	9 278			1	9 329	
	4	9 398		7	1	9 412	
	3	9 350			2	9 388	
	2	9 346			3	9 376	
	1	9 299			4	9 359	
3	1	9 400			5	9 424	
	2	9 398			6	9 400	
	3	9 356			7	9 426	
	4	9 372			8	9 438	
	5	9 388			9	9 406	
	6	9 434			10	9 414	
	7	9 426			11	9 453	
	8	9 358		8	11	9 410	
	9	9 414			10	9 426	
	10	9 440			9	9 384	
	11	9 390			8	9 419	
4	11	9 369			7	9 424	
	10	9 414			6	9 414	
	9	9 400	В 20 *см* к северу снежница диаметром 1 *м*		5	9 376	
					4	9 322	
					3	9 380	
	8	9 274			2	9 356	
	7	9 362			1	9 398	
	6	9 414		9	1	9 399	
	5	9 408			2	9 376	
	4	9 386			3	9 409	
	3	9 309			4	9 424	
	2	9 360			5	9 412	
	1	9 370			6	9 418	
5	1	9 392			7	9 454	
	2	9 414			8	9 432	
	3	9 409			9	9 440	
	4	9 390			10	9 452	
	5	9 442			11	9 438	

Продолж. приложения V

№ ряда	№ точки	Условная отметка	Примечание	№ ряда	№ точки	Условная отметка	Примечание
		Sept. 3 сентября 1950 г.					
	Репер № 2	10 000		5	7	9 207	
1	1	9 262			8	9 336	
	2	9 243			9	9 307	
	3	9 304			10	9 300	
	4	9 269			11	9 296	
	5	9 245		6	11	9 332	
	6	9 264			10	9 327	
	7	9 269			9	9 348	
	8	9 295			8	9 348	
	9	9 292			7	9 299	
	10	9 304			6	9 292	
	11	9 216			5	9 308	
2	1	9 296			4	9 284	
	2	9 274			3	9 282	
	3	9 292			2	9 274	
	4	9 298			1	9 252	
	5	9 262		7	1	9 317	
	6	9 288			2	9 286	
	7	9 316			3	9 268	
	8	9 312			4	9 302	
	9	9 344			5	9 297	
	10	9 308			6	9 288	
	11	9 250			7	9 317	
3	1	9 297			8	9 348	
	2	9 306			9	9 367	
	3	9 317			10	9 384	
	4	9 275			11	9 348	
	5	9 292		8	11	9 310	
	6	9 324			10	9 315	
	7	9 242			9	9 310	
	8	9 272			8	9 299	
	9	9 336			7	9 299	
	10	9 332			6	9 317	
	11	9 299			5	9 386	
4	11	9 260			4	9 335	
	10	9 315			3	9 296	
	9	9 310			2	9 236	
	8	9 246			1	9 170	
	7	9 140		9	1	9 362	
	6	9 308			2	9 284	
	5	9 227			3	9 352	
	4	9 342			4	9 316	
	3	9 337			5	9 298	
	2	9 318			6	9 292	
	1	9 297			7	9 274	
5	1	9 267			8	9 296	
	2	9 329			9	9 298	
	3	9 386			10	9 354	
	4	9 275			11	9 349	
	5	9 314			Репер № 2	10 005	
	6	9 282					

Приложение VI

Нивелировка опытной площадки № 2
(со спуском воды, очищенной от снега)

№ ряда	№ точки	Условная отметка	Высота воды (см)	Примечание
		19 июня 1950 г.		
	Репер № 2	10 000	—	
1	1	9 380	—	
	2	9 382	—	
	3	9 386	—	
	4	9 386	—	
	5	9 350	—	
	6	9 200	8	Северная часть майны
	7	9 390	—	
	8	9 396	—	
	9	9 312	2	
	10	9 322	—	
	11	9 308	—	В центре снежницы
2	11	9 270	18	
	10	9 292	—	
	9	9 397	—	
	8	9 424	—	
	7	9 436	—	
	6	9 094	—	
	5	9 318	—	
	4	9 325	—	
	3	9 330	—	
	2	9 274	—	
	1	9 358	—	
3	1	9 358	—	
	2	9 372	—	
	3	4 326	—	
	4	9 394	—	
	5	9 435	—	
	6	9 226	6	
	7	9 340	—	
	8	9 450	—	
	9	9 420	—	
	10	9 355	—	
	11	9 234	6	В центре снежницы диаметром 1 м
4	11	9 206	6	Северная часть снежницы
	10	9 398	—	
	9	9 436	—	
	8	9 442	—	
	7	9 436	—	
	6	9 424	—	
	5	9 430	—	
	4	9 388	—	
	3	9 355	—	
	2	9 370	—	
	1	9 372	—	
5	1	9 370	—	
	2	9 406	—	
	3	9 383	—	
	4	9 370	—	
	5	9 454	—	
	6	9 434	—	
	7	9 435	13	Центр снежницы
	8	9 468	—	
	9	9 453	—	
	10	9 180	14	Южная часть снежницы
	11	9 432	—	
6	11	9 343	—	
	10	9 134	—	
	9	9 435	—	
	8	9 416	—	
	7	9 410	—	
	6	9 404	—	
	5	9 192	—	
	4	9 400	—	
	3	9 370	—	
	2	9 436	—	
	1	9 330	—	
7	1	9 412	—	
	2	9 446	—	
	3	9 282	—	
	4	9 202	9	Юго-западная часть снежницы диаметром 2 м
	5	9 406	—	
	6	9 420	—	
	7	9 370	—	
	8	9 411	—	
	9	9 357	11	Снежница 2×7 м; западная часть
	10	9 400	13	То же центральная часть
	11	9 388	15	То же восточная часть
8	11	9 180	—	
	10	9 128	—	
	9	9 116	—	
	8	9 368	—	
	7	9 372	—	
	6	9 388	—	
	5	9 384	—	
	4	9 370	—	
	3	9 170	10	
	2	9 388	—	
	1	9 374	—	
9	1	9 092	19	
	2	9 143	12	
	3	9 158	—	
	4	9 180	10	
	5	9 184	9	

Продолж. приложения VI

№ ряда	№ точки	Условная отметка	Высота воды (см)	Примечание
9	6	9 368	—	
	7	9 396	—	
	8	9 396	—	
	9	9 406	—	
	10	9 414	—	
	11	9 425	—	
		3 сентября 1950 г.		
1	Репер № 2	10 000	—	
	1	9 340	—	
	2	9 257	—	
	3	9 338	—	
	4	9 310	—	
	5	9 295	—	
	6	9 282	—	
	7	9 267	—	
	8	9 286	—	
	9	9 285	—	
	10	9 348	—	
	11	9 371	—	
2	11	9 270	—	
	10	9 284	—	
	9	9 282	—	
	8	9 298	—	
	7	9 324	—	
	6	9 338	—	
	5	9 146	—	Урез воды в снежнице то же
	4	9 148	—	
	3	9 246	—	
	2	9 270	—	
	1	9 146	—	
3	1	9 300	—	
	2	9 360	—	
	3	9 300	—	
	4	9 293	—	
	5	9 288	—	
	6	9 150	—	Урез воды в снежнице
	7	9 366	—	
	8	9 373	—	
	9	9 280	—	
	10	9 162	—	Урез воды в снежнице
	11	9 148	—	
4	11	9 322	—	
	10	9 150	—	Урез воды в снежнице
	9	9 335	—	
	8	9 326	—	
	7	9 347	—	
	6	9 306	—	
	5	9 342	—	
	4	9 346	—	
	3	9 312	—	
	2	9 330	—	
	1	9 132	—	
5	1	9 192	—	
	2	9 312	—	
	3	9 270	—	
	4	9 325	—	
	5	9 280	—	
	6	9 280	—	
	7	9 299	—	
	8	9 314	—	
	9	9 138	—	Урез воды в снежнице
	10	9 230	—	
	11	9 330	—	
6	11	9 342	—	
	10	9 146	—	Урез воды в снежнице
	9	9 292	—	
	8	9 324	—	
	7	9 292	—	
	6	9 306	—	
	5	9 263	—	
	4	9 275	—	
	3	9 267	—	
	2	9 343	—	
	1	9 198	—	
7	1	9 282	—	
	2	9 350	—	
	3	9 302	—	
	4	9 275	—	
	5	9 298	—	
	6	9 275	—	
	7	9 285	—	
	8	9 308	—	
	9	9 222	—	
	10	9 320	—	
	11	9 210	—	
8	1	9 317	—	
	2	9 294	—	
	3	9 148	—	Урез воды в снежнице
	4	9 295	—	
	5	9 296	—	
	6	9 290	—	
	7	9 302	—	
	8	9 226	—	
	9	9 147	—	Урез воды в снежнице то же
	10	9 147	—	
	11	9 280	—	
9	1	9 130	—	Урез воды в снежнице то же
	2	9 133	—	
	3	9 135	—	
	4	9 220	—	
	5	9 225	—	
	6	9 328	—	
	7	9 348	—	
	8	9 280	—	
	9	9 297	—	
	10	9 300	—	
	11	9 346	—	
	Репер № 2	1 000	—	
	Урез воды в майне	9 138	—	

Приложение VII

Нивелировка опытной площадки № 3
(без спуска воды, очищенной от снега)

№ ряда	№ точки	Условная отметка	Высота воды (см)	№ ряда	№ точки	Условная отметка	Высота воды (см)
	19 июля 1950 г.						
	Репер № 2	10 000	—	5	8	9 382	—
1	1	9 327	—		9	9 400	—
	2	9 348	—		10	9 248	—
	3	9 384	—		11	9 329	6
	4	9 364	—	6	1	9 407	—
	5	9 366	—		2	9 438	—
	6	9 327	—		3	9 372	—
	7	9 270	—		4	9 437	—
	8	9 292	—		5	9 428	—
	9	9 306	—		6	9 446	—
	10	9 377	—		7	9 402	—
	11	9 328	—		8	9 462	—
2	1	9 374	—		9	9 391	—
	2	9 338	—		10	9 378	—
	3	9 307	—		11	9 420	—
	4	9 322	—	7	1	9 362	—
	5	9 276	—		2	9 312	—
	6	9 286	—		3	9 318	—
	7	9 308	—		4	9 342	—
	8	9 232	—		5	9 290	—
	9	9 386	—		6	9 388	—
	10	9 447	—		7	9 392	—
	11	9 278	—		8	9 408	—
3	1	9 176	11		9	9 367	—
	2	9 317	—		10	9 321	—
	3	9 398	—		11	9 390	—
	4	9 272	—	8	1	9 232	5
	5	9 236	6		2	9 266	4
	6	9 307	—		3	9 352	—
	7	9 354	—		4	9 384	—
	8	9 286	—		5	9 542	—
	9	9 410	—		6	9 400	—
	10	9 222	6		7	9 204	—
	11	9 209	7		8	9 507	—
4	1	9 448	—		9	9 552	—
	2	9 347	—		10	9 382	—
	3	9 409	—		11	9 326	—
	4	9 414	—	9	1	9 360	—
	5	9 272	2		2	9 450	—
	6	9 396	—		3	9 492	—
	7	9 462	—		4	9 477	—
	8	9 394	—		5	9 407	—
	9	9 392	—		6	9 404	—
	10	9 247	—		7	9 396	—
	11	9 228	—		8	9 312	—
5	1	9 432	—		9	9 314	—
	2	9 359	—		10	9 342	—
	3	9 395	—		11	9 328	—
	4	9 394	—	10	1	9 444	—
	5	9 432	—		2	9 522	—
	6	9 400	—		3	9 526	—
	7	9 434	—		4	9 442	—

Продолж. приложения VII

№ ряда	№ точки	Условная отметка	Высота воды (см)	№ ряда	№ точки	Условная отметка	Высота воды (см)
			—				—
			—				—
10	5	9 428	—	15	3	9 470	—
	6	9 428	—		4	9 417	—
	7	9 410	—		5	9 426	—
	8	9 289	—		6	9 444	—
	9	9 207	8		7	9 428	—
	10	9 325	—		8	9 422	—
	11	9 376	—		9	9 326	—
11	1	9 372	—		10	9 180	10
	2	9 302	—		11	9 088	20
	3	9 322	—	16	1	9 396	—
	4	9 274	—		2	9 426	—
	5	9 262	—		3	9 446	—
	6	9 228	5		4	9 412	—
	7	9 328	—		5	9 400	—
	8	9 272	—		6	9 428	—
	9	9 206	9		7	9 458	—
	10	9 287	—		8	9 434	—
	11	9 390	—		9	9 390	—
12	1	9 169	10		10	9 142	—
	2	9 122	15		11	9 054	—
	3	9 120	18	17	1	9 410	—
	4[1]	9 454	—		2	9 358	—
	5	9 130	16		3	9 406	—
	6	9 126	15		4	9 442	—
	7	9 182	10		5	9 432	—
	8	9 192	7		6	9 424	—
	9	9 400	—		7	9 398	—
	10	9 452	—		8	9 402	—
	11	9 474	—		9	9 430	—
13	1	9 224	—		10	9 390	—
	2	9 186	11		11	9 338	—
	3	9 194	10				
	4	9 378	—				
	5	9 310	—		12 сентября 1950 г.		
	6	9 385	—		Репер № 2	10 000	—
	7	9 432	—	1	1	9 178	—
	8	9 488	—		2	9 169	—
	9	9 474	—		3	9 187	—
	10	9 446	—		4	9 166	—
	11	9 512	—		5	9 223	—
14	1	9 408	—		6	9 153	—
	2	9 254	—		7	9 157	—
	3	9 434	—		8	9 161	—
	4	9 442	—		9	9 146	—
	5	9 474	—		10	9 182	—
	6	9 442	—		11	9 153	—
	7	9 390	—	2	1	9 182	—
	8	9 377	—		2	9 165	—
	9	9 395	—		3	9 159	—
	10	9 392	—		4	9 156	—
	11	9 388	—		5	9 153	—
15	1	9 490	—		6	9 148	—
	2	9 474	—				

[1] Островок 1×1 м.

Продолж. приложения VII

№ ряда	№ точки	Условная отметка	Высота воды (см)	№ ряда	№ точки	Условная отметка	Высота воды (см)
2	7	9 163	—	5	8	9 247	—
	8	9 153	—		7	9 276	—
	9	9 223	—		6	9 293	—
	10	9 229	—		5	9 295	—
	11	9 169	—		4	9 264	—
					3	9 305	—
					2	9 241	—
					1	9 280	—
	16 сентября 1950 г.			6	1	9 281	—
1	1	9 264	—		2	9 276	—
	2	9 251	—		3	9 222	—
	3	9 278	—		4	9 254	—
	4	9 288	—		5	9 270	—
	5	9 315	—		6	9 273	—
	6	9 282	—		7	9 278	—
	7	9 250	—		8	9 303	—
	8	9 248	—		9	9 270	—
	9	9 233	—		10	9 258	—
	10	9 316	—		11	9 274	—
	11	9 226	—	7	1	9 313	—
2	1	9 324	—		2	9 312	—
	2	9 264	—		3	9 228	—
	3	9 235	—		4	9 242	—
	4	9 293	—		5	9 298	—
	5	9 250	—		6	9 241	—
	6	9 268	—		7	9 278	—
	7	9 251	—		8	9 288	—
	8	9 196	—		9	9 281	—
	9	9 273	—		10	9 238	—
	10	9 352	—		11	9 280	—
	11	9 301	—	8	1	9 196	—
3	11	9 287	—		2	9 232	—
	10	9 208	—		3	9 216	—
	9	9 291	—		4	9 298	—
	8	9 230	—		5	9 298	—
	7	9 270	—		6	9 288	—
	6	9 262	—		7	9 345	—
	5	9 196	—		8	9 319	—
	4	9 322	—		9	9 281	—
	3	9 273	—		10	9 238	—
	2	9 232	—		11	9 255	—
	1	9 303	—	9	11	9 252	—
4	1	9 344	—		10	9 248	—
	2	9 311	—		9	9 222	—
	3	9 345	—		8	9 331	—
	4	9 307	—		7	9 352	—
	5	9 246	—		6	9 274	—
	6	9 278	—		5	9 281	—
	7	9 305	—		4	9 295	—
	8	9 308	—		3	9 313	—
	9	9 263	—		2	9 293	—
	10	9 195	—		1	9 220	—
	11	9 244	—	10	1	9 335	—
5	11	9 238	—		2	9 312	—
	10	9 211	—		3	9 268	—
	9	9 303	—				

Продолж. приложения VII

№ ряда	№ точки	Условная отметка	Высота воды (см)	№ ряда	№ точки	Условная отметка	Высота воды (см)
10	4	9 228	—	14	3	9 328	—
	5	9 266	—		4	9 278	—
	6	9 294	—		5	9 286	—
	7	9 338	—		6	9 294	—
	8	9 214	—		7	9 278	—
	9	9 212	—		8	9 274	—
	10	9 284	—		9	9 274	—
	11	9 273	—		10	9 232	—
11	11	9 316	—		11	9 250	—
	10	9 308	—	15	11	9 228	—
	9	9 198	—		10	9 267	—
	8	9 201	—		9	9 278	—
	7	9 202	—		8	9 303	—
	6	9 198	—		7	9 300	—
	5	9 206	—		6	9 264	—
	4	9 206	—		5	9 268	—
	3	9 188	—		4	9 270	—
	2	9 193	—		3	9 310	—
	1	9 208	—		2	9 324	—
12	1	9 200	—		1	9 288	—
	2	9 190	—	16	1	9 268	—
	3	9 184	—		2	9 263	—
	4	9 204	—		3	9 286	—
	5	9 178	—		4	9 274	—
	6	9 209	—		5	9 237	—
	7	9 208	—		6	9 270	—
	8	9 313	—		7	9 286	—
	9	9 328	—		8	9 258	—
	10	9 317	—		9	9 312	—
	11	9 331	—		10	9 228	—
13	11	9 328	—		11	9 180	—
	10	9 316	—	17	11	9 202	—
	9	9 283	—		10	9 309	—
	8	9 308	—		9	9 300	—
	7	9 310	—		8	9 222	—
	6	9 305	—		7	9 266	—
	5	9 332	—		6	9 274	—
	4	9 340	—		5	9 274	—
	3	9 220	—		4	9 306	—
	2	9 238	—		3	9 242	—
	1	9 280	—		2	9 258	—
14	1	9 358	—		1	9 274	—
	2	9 307	—				

Приложение VIII

Нивелировка опытной площадки № 4

(без спуска воды, с естественным снежным покровом)

№ ряда	№ точки	Условная отметка	Высота воды (*см*)	№ ряда	№ точки	Условная отметка	Высота воды (*см*)
	19 июля 1950 г.			5	8	9 402	—
					9	9 321	—
					10	9 419	—
1	Репер № 2	1 000	—		11	9 435	—
	1	9 355	—	6	1	9 325	—
	2	9 363	—		2	9 398	—
	3	9 439	—		3	9 437	—
	4	9 448	—		4	9 379	—
	5	9 426	—		5	9 307	—
	6	9 211	6		6	9 188	—
	7	9 221	5		7	9 193	10
	8	9 210	7		8	9 355	9
	9	9 161	10		9	9 441	—
	10	9 141	13		10	9 335	—
	11	9 398	—		11	9 388	—
2	1	9 451	—	7	1	9 399	—
	2	9 405	—		2	9 35.)	4
	3	9 395	—		3	9 245	—
	4	9 419	—		4	9 298	—
	5	9 367	—		5	9 289	—
	6	9 329	—		6	9 471	—
	7	9 385	—		7	9 195	9
	8	9 362	—		8	9 183	10
	9	9 371	—		9	9 451	—
	10	9 140	—		10	9 353	—
	11	9 429	—		11	9 335	—
3	1	9 396	—	8	1	9 373	—
	2	9 399	—		2	9 387	—
	3	9 421	—		3	9 293	—
	4	9 458	—		4	9 439	—
	5	9 399	—		5	9 397	—
	6	9 406	—		6	9 435	—
	7	9 415	—		7	9 353	—
	8	9 433	—		8	9 223	—
	9	9 403	—		9	9 365	—
	10	9 419	—		10	9 413	—
	11	9 441	—		11	9 443	—
4	1	9 303	—	9	1	9 253	—
	2	9 323	—		2	9 355	—
	3	9 389	—		3	9 383	—
	4	9 411	—		4	9 413	—
	5	9 339	—		5	9 369	—
	6	9 395	—		6	9 373	—
	7	9 389	—		7	9 379	—
	8	9 411	—		8	9 389	—
	9	9 197	8		9	9 413	—
	10	9 335	—		10	9 443	—
	11	9 425	—		11	9 413	—
5	1	9 451	—	10	1	9 379	—
	2	9 415	—		2	9 433	—
	3	9 287	—		3	9 418	—
	4	9 386	—		4	9 389	—
	5	9 397	—		5	9 381	—
	6	9 198	8		6	9 379	—
	7	9 525	—				

Продолж. приложения VIII

№ ряда	№ точки	Условная отметка	Высота воды (*см*)	№ ряда	№ точки	Условная отметка	Высота воды (*см*)
10	7	9 281	—	16	11	9 484	—
	8	9 356	—		10	9 390	—
	9	9 403	—		9	9 390	—
	10	9 419	—		8	9 335	—
	11	9 371	—		7	9 300	—
11	1	9 413	—		6	9 266	—
	2	9 379	—		6	9 344	—
	3	9 388	—		4	9 400	—
	4	9 383	—		3	9 440	—
	5	9 369	—		2	9 408	—
	6	9 353	—		1	9 387	—
	7	9 423	—	17	1	9 363	—
	8	9 371	—		2	9 354	—
	9	9 333	—		3	9 190	8
	10	9 369	—		4	9 386	—
	11	9 341	—		5	9 202	7
12	1	9 411	—		6	9 310	—
	2	9 445	—		7	9 380	—
	3	9 397	—		8	9 415	—
	4	9 368	—		9	9 335	—
	5	9 435	—		10	9 3 0	—
	6	9 346	—		11	9 446	—
	7	9 358	—		Урез воды в майне	9 272	—
	8	9 385	—				
	9	9 353	—		16 сентября 1950 г.		
	10	9 465	—				
	11	9 408	—				
13	1	9 445	—	1	Репер № 2	10 000	—
	2	9 386	—		1	9 250	—
	3	9 334	—		2	9 209	—
	4	9 368	—		3	9 294	—
	5	9 420	—		4	9 301	—
	6	9 368	—		5	9 280	—
	7	9 430	—		6	9 291	—
	8	9 360	—		7	9 264	—
	9	9 408	—		8	9 270	—
	10	9 342	—		9	9 222	—
	11	9 345	—		10	9 274	—
14	1	9 434	—		11	9 231	—
	2	9 380	—	2	11	9 204	—
	3	9 370	—		10	9 218	—
	4	9 428	—		9	9 214	—
	5	9 428	—		8	9 278	—
	6	9 384	—		7	9 276	—
	7	9 414	—		6	9 252	—
	8	9 192	8		5	9 267	—
	9	9 196	6		4	9 276	—
	10	9 416	—		3	9 294	—
	11	9 376	—		2	9 250	—
15	1	9 406	—		1	9 282	—
	2	9 418	—	3	1	9 240	—
	3	9 335	—		2	9 294	—
	4	9 105	11		3	9 292	—
	5	9 288	—		4	9 336	—
	6	9 386	—		5	9 297	—
	7	9 375	—		6	9 282	—
	8	9 360	—		7	9 291	—
	9	9 342	—		8	9 274	—
	10	9 462	—		9	9 273	—
	11	9 446	—		10	9 296	—
					11	9 281	—

Продолж. приложения VIII

№ ряда	№ точки	Условная отметка	Высота воды (*см*)	№ ряда	№ точки	Условная отметка	Высота воды (*см*)
4	11	9 282	—	9	6	9 272	—
	10	9 276	—		7	9 306	—
	9	9 279	—		8	9 334	—
	8	9 254	—		9	9 284	—
	7	9 298	—		10	9 314	—
	6	9 293	—		11	9 326	—
	5	9 306	—	10	11	9 266	—
	4	9 304	—		10	9 270	—
	3	9 240	—		9	9 294	—
	2	9 264	—		8	9 309	—
	1	9 258	—		7	9 274	—
5	1	9 299	—		6	9 284	—
	2	9 289	—		5	9 274	—
	3	9 300	—		4	9 278	—
	4	9 339	—		3	9 280	—
	5	9 301	—		2	9 274	—
	6	9 226	—		1	9 297	—
	7	9 344	—	11	1	9 264	—
	8	9 322	—		2	9 294	—
	9	9 262	—		3	9 276	—
	10	9 288	—		4	9 284	—
	11	9 224	—		5	9 294	—
6	11	9 300	—		6	9 272	—
	10	9 244	—		7	9 284	—
	9	9 280	—		8	9 286	—
	8	9 329	—		9	9 256	—
	7	9 220	—		10	9 310	—
	6	9 228	—		11	9 308	—
	5	9 196	—	12	11	9 292	—
	4	9 284	—		10	9 340	—
	3	9 314	—		9	9 364	—
	2	9 309	—		8	9 254	—
	1	9 288	—		7	9 250	—
7	1	9 256	—		6	9 273	—
	2	9 284	—		5	9 302	—
	3	9 229	—		4	9 314	—
	4	9 338	—		3	9 322	—
	5	9 244	—		2	9 277	—
	6	9 377	—		1	9 326	—
	7	9 197	—	13	1	9 139	—
	8	9 184	—		2	9 316	—
	9	9 316	—		3	9 194	—
	10	9 300	—		4	9 286	—
	11	9 230	—		5	9 309	—
8	11	9 270	—		6	9 332	—
	10	9 277	—		7	9 280	—
	9	9 256	—		8	9 324	—
	8	9 254	—		9	9 298	—
	7	9 290	—		10	9 278	—
	6	9 332	—		11	9 254	—
	5	9 289	—	14	11	9 322	—
	4	9 320	—		10	9 276	—
	3	9 248	—		9	9 242	—
	2	9 204	—		8	9 264	—
	1	9 380	—		7	9 294	—
9	1	9 287	—		6	9 314	—
	2	9 294	—		5	9 340	—
	3	9 336	—		4	9 160	—
	4	9 277	—		3	9 307	—
	5	9 252	—		2	9 348	—
					1	9 264	—

Продолж. приложения VIII

№ ряда	№ точки	Условная отметка	Высота воды (*см*)	№ ряда	№ точки	Условная отметка	Высота воды (*см*)
5	1	9 337	—	16	5	9 306	—
	2	9 346	—		4	9 271	—
	3	9 320	—		3	9 194	—
	4	9 286	—		2	9 305	—
	5	9 341	—		1	9 309	—
	6	9 222	—	17	1	9 314	—
	7	9 314	—		2	9 295	—
	8	9 237	—		3	9 247	—
	9	9 260	—		4	9 289	—
	10	9 297	—		5	9 341	—
	11	9 301	—		6	9 321	—
16	11	9 274	—		7	9 339	—
	10	9 286	—		8	9 323	—
	9	9 301	—		9	9 317	—
	8	9 308	—		10	9 304	—
	7	9 322	—		11	9 250	—
	6	9 271	—				

Приложение IX

Нивелировка опытной площадки на однолетнем льду, посыпанном опилками

№ ряда	№ точки	Условная отметка	Высота воды (см)	Примечание
				July 19 июля 1950 г.
1	Репер № 2	10 000	—	
	1	9 435	—	1. Лед
	2	9 387	—	"
	3	9 335	—	"
	4	9 355	—	"
	5	9 333	—	"
	6	9 113	12	Вода выступает языком от площадки с опилками 2
	7	9 065	20	2. то же
	8	9 335	—	1. Лед
	9	9 345	—	"
	10	9 383	—	"
	11	9 466	—	"
2	1	9 057	22	4. Опилки в воде
	2	9 048	21	3. то же
	3	9 053	23	"
	4	9 055	11	"
	5	9 017	22	"
	6	9 039	19	"
	7	9 020	21	"
	8	9 020	21	"
	9	9 025	20	"
	10	9 020	21	"
	11	9 151	13	"
3	1	9 043	24	"
	2	9 103	—	"
	3	9 473	—	"
	4	9 481	—	5. Опилки
	5	9 490	—	"
	6	9 529	—	"
	7	9 498	—	"
	8	9 475	—	"
	9	9 475	—	"
	10	9 197	—	4. Опилки в воде
	11	5 051	—	6. Вода
4	1	8 945	—	"
	2	9 097	—	4. Опилки в воде
	3	9 479	—	5. Опилки
	4	9 503	—	"
	5	9 501	—	"
	6	9 508	—	"
	7	9 493	—	"
	8	9 463	—	"
	9	9 475	—	"
	10	9 218	—	4. Опилки в воде
	11	9 081	—	6. Вода
5	1	8 477	—	Вода 6.
	2	8 993	—	Опилки в воде 4.
	3	9 030	—	то же 3.
	4	9 063	—	"
	5	9 027	—	"
	6	9 095	—	"
	7	9 105	—	"
	8	9 153	—	"
	9	8 883	—	"
	10	—	Майна	Вода 6.
	11	9 068	—	"
6	1	8 901	—	"
	2	8 963	—	Опилки в воде 4.
	3	8 968	—	то же 3.
	4	8 920	—	"
	5	9 031	—	"
	6	9 217	—	На склоне площадки опилки в воде 7.
	7	9 521	—	Опилки 5.
	8	9 475	—	"
	9	9 447	—	"
	10	—	Майна	"
	11	—	—	"
7	1	8 878	—	Вода 6.
	2	8 937	—	Опилки в воде 4.
	3	9 040	—	то же 3.
	4	8 991	—	"
	5	9 058	—	"
	6	9 233	—	"
	7	9 353	—	Опилки 5.
	8	9 363	—	"
	9	9 453	—	Лед 1.
	10	9 093	—	Вода 2.
	11	9 021	—	"
8	1	8 733	—	"
	2	9 055	—	Опилки в воде 4.
	3	9 119	—	то же 3.
	4	9 066	—	"
	5	9 061	—	"
	6	9 123	—	"
	7	9 401	—	Опилки 5.
	8	9 363	—	"
	9	9 467	—	"
	10	9 153	—	Вода 6.
	11	9 003	—	"
9	1	8 741	—	"
	2	8 893	—	Опилки в воде 4.
	3	8 901	—	то же 3.

Продолж. приложения IX

№ ряда	№ точки	Условная отметка	Высота воды (см)	Примечание
9	4	8 895	—	4. Опилки в воде
	5	9 085	—	3. то же
	6	9 235	—	"
	7	9 523	—	5. Опилки
	8	9 353	—	"
	9	9 538	—	"
	10	9 001	—	4. Опилки в воде
	11	9 178	—	6. Вода
10	1	8 398	—	"
	2	8 428	—	"
	3	8 817	—	"
	4	8 933	—	4. Опилки в воде
	5	9 161	—	3. то же
	6	9 359	—	5. Опилки
	7	9 269	—	"
	8	9 431	—	"
	9	9 177	—	4. Опилки в воде
	10	9 029	—	3. то же
	11	9 261	—	6. Вода
11	1	—	—	8. Майна
	2	—	—	"
	3	—	—	"
	4	8 829	—	6. Вода
	5	9 108	—	4. Опилки в воде
	6	9 189	—	3. то же
	7	9 165	—	"
	8	9 466	—	5. Опилки
	9	9 545	—	"
	10	9 097	—	4. Опилки в воде
	11	9 335	—	9. Чистый лед
12	1	8 945	—	6. Вода
	2	8 818	—	"
	3	8 931	—	"
	4	8 951	—	"
	5	9 041	—	4. Опилки в воде

№ ряда	№ точки	Условная отметка	Высота воды (см)	Примечание
	6	9 013	—	Опилки в воде 4.
	7	9 061	—	то же 3.
	8	9 079	—	"
	9	9 107	—	"
	10	9 047	—	"
	11	9 398	—	Лед 1.
	Репер № 2	10 000	—	"
				August 9 августа 1950 г.
	Репер № 2	10 000	—	
	1	9 326	—	
	2	9 330	—	Точки № 1—11 на естественном льду 10.
	3	9 332	—	
	4	9 309	—	
	5	9 334	—	
	6	9 321	—	
	7	9 298	—	
	8	9 298	—	
	9	9 280	—	
	10	9 282	—	
	11	9 202	—	
	12	9 544	—	Точки № 12—23 на площадке с опилками 11.
	13	9 411	—	
	14	9 356	—	
	15	9 480	—	
	16	9 336	—	
	17	9 346	—	
	18	9 391	—	
	19	9 540	—	
	20	9 451	—	
	21	9 469	—	
	22	9 498	—	
	23	9 510	—	
	Урез воды в озере	9 150	—	

Приложение X

Нивелировка площадки на многолетнем льду

№ точки	Условная отметка	№ точки	Условная отметка
1 июля 1950 г.		Пикет № 13	8 397
		42	8 597
Репер № 3	10 000	43	8 300
Пикет № 1	8 467	44	8 334
1	8 173	45	8 932
2	8 359	Пикет № 14	8 586
Пикет № 2	8 534	46	8 219
3	8 245	47	8 314
4	8 306	48	8 864
Пикет № 3	8 393	49	8 378
5	8 612	Пикет № 15	8 511
6	8 404	50	8 412
7	8 811	51	8 649
Пикет № 4	8 553	52	8 798
8	8 277	Пикет № 16	8 609
9	8 734	53	8 312
10	8 473	54	8 331
11	8 799	55	8 633
Пикет № 5	8 357	Пикет № 17	8 668
12	8 330	56	8 911
13	8 288	57	8 355
14	8 661	58	8 722
Пикет № 6	8 282	18	8 388
15	8 239	59	8 684
16	8 561	60	8 951
17	8 404	61	8 500
18	8 681	Пикет № 19	8 688
19	8 311	62	8 934
20	8 619	63	8 376
21	8 274	Пикет № 20	8 375
22	8 329	64	8 696
Пикет № 7	8 257	65	8 812
23	8 559	66	8 576
24	8 729	67	9 948
25	8 286	68	8 955
26	8 485	Пикет № 21	9 674
Пикет № 8	8 586	69	9 871
27	8 391	70	9 229
28	8 274	71	8 581
29	8 558	Пикет № 22	8 476
30	8 329	23	8 394
Пикет № 9	8 451	24	8 261
31	8 302	72	8 458
32	8 353	Пикет № 25	8 381
Пикет № 10	8 500	73	8 266
33	8 451	74	8 504
34	8 591	Пикет № 26	8 284
35	8 339	75	8 521
Пикет № 11	8 541	Пикет № 27	8 426
36	8 550	Урез воды	8 235
37	8 348	в снежнице	
38	8 554		
Пикет № 12	8 492	10 июля 1950 г.	
39	8 342		
40	8 693	Репер № 3	10 000
41	8 285	Пикет № 4	8 519
		1	8 192
			8 464

Продолж. приложения X

№ точки	Условная отметка	№ точки	Условная отметка
2	8 284	Пикет № 5	8 382
Пикет № 2	8 506	13	8 181
3	8 210	14	8 711
4	8 222	Пикет № 6	8 268
Пикет № 3	8 447	16	8 640
5	8 574	17	8 154
6	8 401	21	8 194
7	8 706	22	8 434
8	8 104	Пикет № 7	8 238
9	8 624	Урез воды	8 229
10	8 585	в снежнице	
11	8 834		
12	8 382		

Приложение XI

Нивелировка по оси аэродрома на однолетнем льду

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота слоя льда, пробиваемого рейкой (см)	Примечание
		август 6 августа 1950 г.		
Урез воды в трещине	—	10 000	—	Начало аэродрома
1	0	10 062	8	
2	5	10 114	8	
3	10	10 142	8	
4	15	10 098	10	
5	20	10 126	9	
6	25	10 098	10	
7	30	10 122	8	
8	35	10 114	8	
9	40	10 100	7	
10	45	10 091	10	
11	50	10 090	10	
12	55	10 099	9	
13	60	10 080	9	
14	65	10 124	9	Слева от оси сплошные снежницы на границе аэродрома
15	70	10 116	7	
16	75	10 107	8	
17	80	10 096	10	
18	85	10 132	10	
19	90	10 111	9	На 1 м левее снежница 20×20 м, засыпанная снегом
20	95	10 122	10	
21	100	10 092	9	
22	105	10 154	9	
23	110	10 152	8	Справа снежница 10×15 м, засыпанная снегом
24	115	10 090	10	
25	120	10 164	11	
26	125	10 112	8	
27	130	10 090	12	
28	135	10 153	10	
29	140	10 114	10	
29	140	10 114	—	Стоянка № 2
30	145	10 106	10	
31	150	10 160	9	
32	155	10 122	9	
33	160	10 140	9	
34	165	10 146	9	
35	170	10 096	10	Справа снежница 10×40 м
36	175	10 114	9	
37	180	10 118	6	
38	185	10 062	13	Снежница, засыпанная снегом
39	190	10 102	9	
40	195	10 146	8	
41	200	10 155	8	
42	205	10 125	8	
43	210	10 146	9	Справа снежница 20×30 м
44	215	10 075	15	Снежница, слой воды 10 см
45	220	10 120	9	
45	220	10 120	—	Стоянка № 3
46	225	10 134	10	
47	230	10 156	11	
48	235	10 094	16	Снежница диаметром 2 м, засыпанная снегом; вода 7 см
49	240	10 146	10	
50	245	10 126	9	
51	250	10 110	8	
52	255	10 112	8	
53	260	10 158	7	
54	265	10 142	8	
55	270	10 096	7	
56	275	10 118	8	
57	280	10 102	9	
58	285	10 112	9	

Приложение XII

Нивелировка по профилю, параллельному оси аэродрома, на однолетнем льду

№ точки	Расстояние от начала хода (м)	Условная отметка	Высота слоя льда, пробиваемого рейкой (см)	Высота воды (см)	Примечание
		август 6 августа 1950 г.			
Урез воды в трещине	—	10 000	—	—	Стоянка № 3
1	0	10 112	12	—	
2	5	9 736	46	35	Снежница 5×8 м
3	10	10 095	13	—	
4	15	10 157	15	—	
5	20	10 130	5	—	
6	25	10 206	14	—	
7	30	10 180	12	—	
8	35	10 237	10	—	
9	40	10 192	10	—	
10	45	10 184	10	—	
11	50	10 137	10	—	
12	55	10 164	3	—	
13	60	10 076	14	30	
14	65	9 712	43	—	
15	70	10 156	8	—	
16	75	10 214	13	—	
17	80	10 228	12	—	
18	85	10 147	13	—	
19	90	10 160	15	—	Справа снежница
20	95	10 094	42	29	Снежница 5×6 м
21	100	9 720	14	—	
22	105	10 078	17	—	
22	105	10 078	17	—	Стоянка № 2
23	110	10 108	10	—	
24	115	10 124	10	—	
25	120	9 928	20	8	
26	125	10 092	20	26	
27	130	10 106	12	—	
28	135	9 728	38	28	
29	140	10 154	10	—	
30	145	10 131	39	21	
31	150	9 803	32	26	
32	155	10 135	7	—	
33	160	10 162	8	—	
34	165	10 140	8	—	
35	170	10 193	10	—	
36	175	10 096	12	30	
37	180	10 074	10	—	
38	185	10 144	8	—	
39	190	10 138	8	—	
39	190	10 144	8	—	Стоянка № 1
40	195	9 718	37	29	
41	200	9 688	37	30	
42	205	10 138	11	—	
43	210	10 156	10	—	
44	215	9 709	40	31	
45	220	9 691	35	32	
46	225	10 120	7	—	
47	230	9 713	28	—	
48	235	10 190	8	—	
49	240	10 169	12	15	
50	245	10 068	10	—	
51	250	10 093	8	—	
52	255	10 157	7	15	
53	260	9 935	20	—	
54	265	10 146	10	—	
55	270	10 119	10	—	
56	275	10 109	10	—	
57	280	10 177	8	—	

Приложение XIII

Нивелировка опытной площадки на многолетнем льду перед заливкой водой

№ точки	Расстояние от начала хода (м)	Условная отметка	Примечание
	дневка 16—20 августа 1950 г.		
Пикет № 0	0	8 898	Начало хода А.
1	—	8 718	
2	—	8 534	
3	—	8 335	
4	—	8 550	
5	—	8 794	
6	—	8 860	
7	—	8 670	
Пикет № 1	40.0	8 885	
Точка № 8	—	8 572	
9	—	8 552	
Пикет № 1	40.0	8 885	
Урез воды	—	8 560	
10	10.0	8 943	
11	20.0	8 733	
12	30.0	8 872	
13	—	8 702	
14	—	8 824	
15	—	8 817	
16	—	8 977	
17	—	8 917	
18	50.0	8 762	
19	60.0	8 707	
20	70.0	8 900	
Пикет № 2	80.0	8 892	
21	—	8 918	
22	—	8 821	
23	—	8 775	
24	—	8 851	
25	—	8 979	
26	—	8 754	
27	—	8 982	
28	—	8 793	
29	84.8	8 693	
30	90.0	8 845	
31	100.0	8 744	
32	110.0	8 927	
33	—	8 581	
34	—	8 962	
35	—	8 739	
36	—	8 941	
37	—	8 717	
38	—	8 693	
39	—	9 019	
40	—	8 867	
41	—	8 817	
42	—	8 817	
43	—	8 899	
44	—	8 799	
45	—	8 902	
46	—	8 819	
47	—	8 767	
48	—	8 915	
49	—	8 767	
50	—	8 895	
51	—	8 765	
52	140.0	8 833	
53	130.0	8 921	
54	—	8 821	
55	—	8 801	
56	—	8 822	
57	—	8 907	
Пикет № 4	160.0	8 842	Стоянка № 2 Б.
58	—	8 805	
Пикет № 3	120.0	8 833	
59	—	8 912	
60	—	8 649	
61	—	8 911	
62	—	8 793	
63	—	8 933	
64	—	8 954	Урез воды в снежнице С.
65	190.0	8 857	
Пикет № 5	200.0	8 755	
66	180.0	8 643	
67	175.4	8 926	
68	170.0	8 746	
69	165.0	8 919	
70	—	8 941	
71	—	8 777	
72	—	8 901	Урез воды в снежнице С
73	—	8 583	
74	—	8 976	
75	—	8 769	
76	—	8 811	
77	—	8 861	
78	—	8 931	
79	—	8 969	
Пикет № 5	—	8 733	
80	—	8 567	Урез воды в снежнице С.
81	—	8 761	
82	—	8 978	
83	—	8 755	
84	—	9 016	
85	—	8 721	
86	—	8 739	
87	—	9 051	
Пикет № 6	240.0	8 854	
88	230.0	8 708	
89	220.0	8 895	
90	219.0	8 775	
91	—	8 874	
92	—	8 673	
93	—	8 589	

Продолж. приложения XIII

№ точки	Расстояние от начала хода (м)	Условная отметка	Примечание
94	—	8 834	
95	—	8 871	
96	—	8 908	
97	—	8 975	
98	—	8 671	
99	—	9 019	
100	—	8 939	
101	—	8 561	
102	—	8 855	
Пикет № 7	280.0	8 943	
103	270.0	8 808	
104	260.0	8 791	
105	250.0	8 916	
106	—	8 946	
107	—	8 747	
108	—	8 851	
109	—	8 986	
110	—	8 859	
111	—	8 801	
Пикет № 7	280.0	8 943	
Пикет № 7	280.0	8 943	Отсчет после перерыва Д.
112	—	8 954	
113	—	8 604	
114	—	9 076	
115	—	8 974	
116	—	9 009	
117	—	8 894	
118	—	8 936	
119	—	8 804	
120	—	9 024	
121	311.3	8 766	
122	300.0	8 804	
123	—	8 978	
124	290.0	8 878	
125	—	8 930	
126	—	8 994	
127	—	9 006	
128	—	8 692	
129	—	8 994	
130	—	8 911	
131	—	8 680	
Репер № 1		10 000	Стоянка № 1
Пикет № 8	320.0	8 945	В.
132	—	8 888	
133	—	9 006	
134	—	9 022	
135	—	8 822	
136	—	8 950	
137	350.0	9 043	
Пикет № 9	360.0	8 993	
138	340.0	8 922	
139	330.0	8 938	
140	323.0	8 690	
141	—	9 022	
142	—	9 018	
143	—	9 058	
144	—	8 854	
145	—	8 972	
146	—	8 976	
147	—	8 923	
148	—	8 972	
149	—	8 578	Урез воды в снежнице С.
150	—	8 955	
Пикет № 10	400.0	8 991	
151	388.0	8 767	
152	374.8	9 014	
153	—	9 048	
154	—	8 992	
155	—	8 626	Урез воды в снежнице С.
156	—	8 906	
157	—	8 918	
158	—	8 613	Урез воды в снежнице С.
159	—	8 944	
160	—	8 984	
161	—	8 923	
162	430.0	8 902	
Пикет № 11	440.0	8 906	
163	—	9 010	
164	—	9 054	
165	—	8 906	
166	—	8 995	
167	—	8 988	
168	—	8 708	
169	—	9 032	
170	—	8 924	
171	—	8 908	
172	—	8 880	
173	470.0	8 890	
174	460.0	8 930	
Пикет № 12	480.0	8 960	
175	450.0	8 968	
176	—	8 987	
177	—	8 880	
178	—	8 923	
179	—	8 733	
180	—	8 596	Урез воды в снежнице С.
181	—	8 918	
182	—	8 923	
183	—	8 848	
184	—	8 682	
185	—	8 946	Урез воды в снежнице С.
186	—	8 796	
187	—	8 982	
188	—	8 904	
189	510.0	8 963	
190	500.0	8 922	
191	490.0	8 806	
192	—	8 963	
193	—	8 931	

Продолж. приложения XIII

№ точки	Расстояние от начала хода (м)	Условная отметка	Примечание
194	—	8 892	
195	—	8 708	
196	—	8 888	
197	—	9 023	
198	—	8 688	
199	—	8 830	
200	—	9 018	
201	—	8 736	
Пикет № 13	520.0	8 870	
202	—	8 622	
203	—	9 068	
204	—	8 777	
205	—	8 826	
206	—	8 784	
207	—	9 062	
208	—	8 818	
209	—	8 957	
210	551.0	8 960	
Пикет № 4	560.0	8 830	
211	542.0	8 802	
212	—	8 967	
213	—	8 980	
214	—	8 934	
215	—	8 832	
216	—	8 957	
217	—	8 990	
218	—	8 856	
219	—	8 922	
220	—	8 655	
221	—	8 866	
222	—	8 981	
223	—	8 794	
224	—	8 820	
225	—	8 957	
226	—	9 007	
227	—	8 674	
228	—	9 320	
229	—	8 782	
230	590.0	8 687	
Пикет № 15	600.0	8 932	
231	580.0	8 932	
232	570.0	8 856	
233	—	8 750	
234	—	8 929	
235	—	8 976	
236	—	8 942	
237	—	8 880	
238	—	8 844	
239	—	8 914	
240	—	8 929	
241	—	9 394	
242	—	9 158	
243	—	8 901	
244	—	8 644	Урез воды в снежнице С
245	—	8 797	
246	—	8 900	
247	—	8 759	
248	—	9 088	
249	637.0	9 442	
250	630.0	8 962	
Пикет № 16	640.0	9 174	
251	—	9 015	
252	617.0	8 762	
253	614.0	8 950	
254	603.0	9 150	
255	—	8 782	
256	—	8 674	
257	—	8 949	
258	—	8 682	
259	—	9 189	
260	—	8 962	
261	—	8 734	
262	—	8 631	Урез воды в снежнице С
263	—	8 847	
264	—	8 844	
265	—	9 116	
266	—	8 904	
267	—	8 805	
268	—	8 792	
269	—	8 734	
270	—	8 890	
271	—	8 929	
272	—	8 811	
273	—	8 875	
274	—	8 979	
275	—	8 658	Урез воды в снежнице С
276	670.0	8 830	
Пикет № 17	680.0	8 925	
277	659.0	8 680	
278	650.0	8 844	
279	—	8 684	
280	—	8 998	
281	—	8 891	
282	—	8 870	
283	—	8 705	
284	—	8 988	
285	—	8 880	
286	—	8 942	
287	—	8 907	
288	—	8 937	
289	—	8 748	
290	—	8 879	
Репер № 3	—	—	230 мм по верхнему волоску Е.
291	—	9 012	
292	—	8 829	
293	—	8 791	
294	—	8 822	
295	—	8 981	
296	—	8 931	
297	—	8 879	

Продолж. приложения XIII

№ точки	Расстояние от начала хода (м)	Условная отметка	Примечание
298	—	8 654	Урез воды в снежнице С
299	—	8 824	
300	710.0	8 902	
301	702.0	8 896	
302	690.0	8 810	
303	—	8 975	
304	—	8 806	
305	—	8 857	
306	—	8 986	
307	—	8 946	
308	—	8 864	
309	—	8 860	
310	—	9 014	
311	—	8 864	
312	—	8 580	
313	—	8 878	
Пикет № 18	720.0	8 856	Стоянка № 3
314	—	8 853	
315	—	8 916	
316	—	8 996	
317	—	8 935	
318	—	8 918	
319	—	8 968	
320	—	8 992	
321	—	8 792	
322	—	9 041	
323	750.0	8 976	
324	—	8 928	
325	735.4	8 807	
Пикет № 19	760.0	8 789	
326	—	8 656	Урез в снежнице С
327	730.0	8 901	
328	—	8 793	
329	—	8 976	
330	—	8 752	
331	—	8 858	
332	—	8 803	
333	—	8 970	
334	—	8 842	
335	—	8 945	
336	—	8 724	
337	—	8 953	
338	—	8 655	Урез воды в снежнице С
339	—	8 880	
340	—	8 827	
341	—	8 902	
342	—	8 885	
343	—	8 852	
344	—	8 922	
345	—	8 846	
346	—	8 957	
347	—	8 801	
348	—	8 893	
349	—	8 644	Урез воды в снежнице С
350	—	8 808	
Пикет № 20	800.0	8 788	
351	792.0	8 870	
352	780.0	8 866	
353	773.0	8 867	
354	—	8 880	
355	—	8 958	
356	—	8 858	
357	—	8 970	
358	—	8 792	
359	—	8 723	
360	—	8 946	
361	—	8 933	
362	—	8 801	
363	—	8 652	
364	—	8 875	
365	—	8 905	
366	—	8 942	
367	—	8 798	
368	—	8 957	
369	—	8 646	Урез воды в снежнице С
370	—	8 818	
371	—	8 858	
Пикет № 21	820.0	8 903	
372	813.4	8 853	
373	—	8 932	
374	—	8 736	
375	—	8 938	
376	—	8 986	
377	—	8 881	
378	—	8 878	
379	—	9 076	
380	—	9 120	
381	—	8 969	
382	—	8 700	
383	—	8 929	
384	—	8 596	Урез воды в трещине F

Приложение XIV

Нивелировка по оси опытной площадки на многолетнем льду после заливки водой

24 сентября 1950 г.

№ точки	Расстояние от начала хода (м)	Условная отметка
Пикет № 0	0	8 938
1	10	9 009
2	20	8 724
3	30	8 892
Пикет № 1	40	8 981
4	50	8 944
5	60	8 881
6	70	8 903
Пикет № 2	80	8 917
7	90	8 892
8	100	8 891
9	110	8 395
Пикет № 3	120	8 912
0	130	8 921
11	140	8 940
12	150	8 937
Пикет № 4	160	8 938
3	140	8 920
14	180	8 890
15	190	8 910
16	210	8 804
17	220	8 952
18	230	8 871
Пикет № 6	240	8 946
19	250	8 948
20	260	8 893
21	270	8 901
Пикет № 7	280	8 921
22	290	8 917
23	300	8 919
24	310	8 874
Пикет № 8	320	8 912
25	330	8 898
26	340	8 935
27	350	8 914
Пикет № 9	360	8 957
Репер № 1		10 000
28	370	8 886
29	380	8 860
30	390	8 912
Пикет № 10	400	8 937
31	410	8 820
32	420	8 814
33	430	8 947
Пикет № 11	440	8 957
34	450	8 921
35	460	8 909
36	470	8 964
Пикет № 12	480	9 019
37	490	8 848
38	500	8 917
39	510	8 869
Пикет № 13	520	8 874
40	530	8 836
41	540	8 870
42	550	8 895
Уровень моря		8 621
Пикет № 14	560	8 874
43	570	8 894
44	580	8 929
45	590	8 873
Пикет № 15	600	8 871
46	610	8 844
47	620	8 874
48	630	8 876
Пикет № 16	640	8 966
49	650	8 915
50	660	8 893
51	670	8 897
Пикет № 17	680	8 920
52	690	8 914
53	700	8 886
54	710	8 906
Пикет № 18	720	8 858
55	730	8 895
56	740	8 868
57	750	8 883
Пикет № 19	760	8 926
58	770	8 888
59	780	8 890
60	790	8 844
Пикет № 20	800	8 874
61	810	8 866
62	820	8 899
63	830	8 893
Пикет № 21	840	8 823
64	850	8 927
65	860	8 907
66	870	9 026
67	880	8 827